ELECTRICAL REVIEW

[ILLUSTRATED.]

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Hill's Electric Thermostat Fire Alarm.

The engravings fully illustrate the details of Hill's Open circuit Electric Thermostat Fire Alarm. The cap and base are of non-conducting wood, exterior surfaces finished and varnished. The electrodes are of hard-drawn spring brass. The contact-points are pure platina. Sensitive disk *B*, of thin sheet copper (No. 28 B. and S. gauge) expanded into the wood in recess, firmly fixed in position. The fusible solder seal, *A*, closing orifice in sensitive disk, is the most fusible permanent solder compound known; softening at about 145° F., and melting at 155° to 160° F. The interior is thoroughly sealed. The details of closed-circuit thermostats are similar to the above, except the positions of platina points. The inventor is Mr. John Hill, mechanical engineer, of Columbus, Ga., the thermostats being manufactured by the Viaduct Company, of Baltimore.

The hermetically sealed case protects the simple interior mechanism against dust and oxidation—the two great enemies of electric contacts. The solder drop closing the orifice in the thin copper sensitive disk, is the most fusible permanent composition of metals yet discovered. It is identical with the solder used in automatic sprinkle heads. We are informed that a thorough test as to the durability of this solder was conducted by order of the Factory Mutual Insurance Companies of Boston, the result of which fully justified the report made by the experts; that this alloy was permanent and was unaffected by age, either in composition or low melting point. In the thermostat the solder melts at a much lower atmospheric temperature than in sprinklers, owing to the very thin sensitive copper disk and very small amount of solder employed, as well as the entire absence of large pipes filled with water to be heated. Automatic sprinklers have operated in 158 fires, and their solder joints have never failed to act. This precedent shows fully the reliability of the fusible solder employed in this thermostat.

In the open-circuit thermostats the electrode spring is held in tension, with the platina points out of contact. Should the solder fail, a contact would be made instantly and alarm given. In the closed-circuit thermostats, the platina points are held in contact by the solder, and any failure would cause the closed circuit to be broken, and a like alarm would result. This thermostat may be used in any electric circuit having an alarm gong. In connection with the ordinary hotel style indicators, of any kind, having press-buttons in apartments, offices, etc., the thermostats have only to be connected with the wires at press-buttons to form a complete fire-alarm apparatus—when the indicator would show the location of the fire. In smaller buildings, a mechanical gong, three to twelve batteries, some conducting wire, and the thermostats distributed where required, would equip the building with an automatic fire alarm. In cities having constant electric-light currents, a small amount of conducting wire, a gong and thermostats may be used.

In speaking of his thermostat the inventor says: "You will find it entirely practical, and not requiring to be continually watched to see if it is there, or broken, or out of order, and in ten or twenty years it will act just as quickly as the day it was put up. Should either an open or closed circuit thermostat ever fail it will announce it by action on circuit. The substantial form of the thermostat allows its use in almost any position of danger—interior or exterior—on walls, ceilings, posts, floors, in closets, attics, garrets, cellars, out-houses, and out of-way places, store houses, hulls of vessels, heaps of coal, lumber or inflammable material, lumber yards, planing mills, manufactures of all kinds, flour mills in every part, including granaries, dust rooms and flues, elevator heads and bolting chests. Anywhere that a fire is liable to occur is the proper place for a thermostat, and any thermostat that cannot be so used, fails in its duty. There is little danger of breakage or damage. It may be struck with a hammer, thrown fifty feet in the air and allowed to fall to the ground, or treated in any reasonably rough manner, and afterwards it will be as efficient as before. It is proof against any ordinary hard usage, as well as the curiosity of the meddlers and of the small boy. Once placed on duty, it will be faithful to its trust until heat unseals it, when its action will be instantaneous, whether the time of call is in ten days or ten years."

FIG. 1.—HILL'S THERMOSTAT.

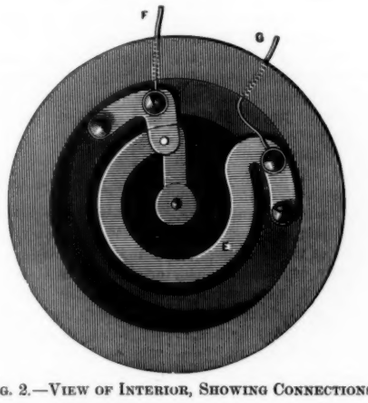


FIG. 2.—VIEW OF INTERIOR, SHOWING CONNECTIONS.

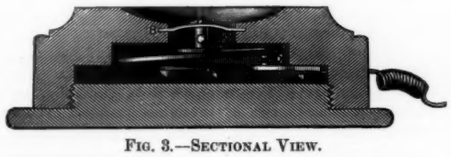


FIG. 3.—SECTIONAL VIEW.

A Story of the Siege of Paris.

BY C. C. HASKINS.

In one of the late numbers of the *Nouvelle Revue*, M. Berthelot graphically describes the various attempts which were made to establish communications between the beleaguered city and the outside world.

There were countless plans proposed, canvassed and abandoned. The desperate condition of the besieged, driven to the direst extremity, wanting food, paying fabulous prices for cats, dogs, even rats, with which to stay the gnawings of hunger, brought the most fanciful projects forward for opening the routes of communication with friends outside the walls of the city.

Balloons were available only in one direction. It was easy enough to depart from Paris, and thus carry from the city any information, but the return was neither feasible nor certain. Carrier pigeons, too, which perform their mission only by returning to their homes, could not be made to play the courier save in one direction.

Bottles containing messages were suggested as a means of conveying intelligence to the lower provinces. These might perhaps float to the mouth of the Seine, but the possibilities of their being broken and lost, or becoming stranded along shore, and finally the chance of their attracting the attention of the enemy, and thus exposing the information they contained—these reasons collectively led to an abandonment of this project.

Then came a proposition to launch upon the Seine light wooden sticks, which, by their peculiar dimensions, color, forms, etc., might be made to represent sentences which had previously been arranged. This plan was carried into effect, the code of signals agreed upon having been carried by venturous patriots to Port-à-l'Anglaise, where the sticks were to be translated. The time necessary to perfect the system and the gradually narrowing lines of the besiegers rendered this scheme impracticable.

Another plan was proposed—the manufacture of hollow balls, within which to place written or printed dispatches, these being concealed beneath floats which would aid them in drifting down the river.

To manufacture the balls was found to require too much precious time, and this, like the former plans, was sorrowfully abandoned.

The chemists then came to the front. Said they: "A chemical solution in the river can neither be stopped nor used against us by the enemy. It is possible to throw into the Seine, at regular intervals, two or three soluble substances, neither of which properly belongs in this water, and which by chemical analysis may be readily shown farther down the stream."

The matter was carefully considered, and the conclusion finally arrived at was, that while in a direct stream without considerable tributaries this plan might be available, with the Seine, fed by so many other water courses, the dilution would be too weak to be of certain value at the end of its journey. Experiment also showed that it required nearly or quite twenty four hours for a solution to pass the tortuous windings of the Seine, beyond the precincts of the doomed metropolis.

The flowing waters having refused to aid the captives, some one suggested that the proper medium for communication was the air, and acoustics the proper means for accomplishing the signaling. Cannon! Yes. Cannon could be fired and their reports, properly arranged by intervals of time, would form an alphabet which could be read by the initiated at long distances, and could not be translated by the enemy. But all cannon sound alike. Combats and artillery skirmishing were constant. How would the friends read an alphabet made up of these elements—dots and spaces—when some "plug" of a Prussian might at any time break in with an extra dot or two in the middle of a letter or a word? This scheme was abandoned as impracticable.

Then the opticians took a hand at the problem. "Let us use light signals." This was better. "Optical telegraphy—yes, that's just the thing." So they arranged a system of lenses by which parallel beams of light were to be sent to a point of safety beyond the lines, where they were to be received through a small opening in a dark chamber at the house of a confederate, and

by a properly arranged lens receiver, recognized and read.

All was carefully arranged within the walls and M. Linajoux was commissioned to perfect the outside arrangements. In the darkness of night the adventurous patriot left Paris in a balloon, but instead of landing at the previously arranged point, he worked his way over to Marseilles, where he opened a school of optical telegraphy, and commenced teaching operators.

So much time was now being wasted that it became necessary to devise other means of relief, and as a last resort electricity was permitted a voice in the matter. The overhead wire to Rouen had been severed, and the wily Prussians had also cut the cable which had been laid in the Seine from Paris to Havre.

M. Clemenceau tells an interesting incident connected with the laying of this cable previous to the siege. M. Richard, telegraph engineer, had been intrusted with the work. He fitted out a small boat which was only run at night, and with no lights visible. The first section of the work was done successfully, but near Bougival it was necessary to cross a slough, the water of which was so shallow as to render the wire almost certain of discovery by the keen-sighted enemy. Accordingly he decided to bury the conductor upon an island and avoid the shallow spot. Landing upon what the party supposed was an abandoned piece of terra firma, what was their surprise to find a "lone fish erman." Two courses of proceedings were open to them. Either to arrest and carry the individual to Havre as a prisoner, or ignore his presence and conduct themselves so as not to attract his attention. They unfortunately chose the latter form of the dilemma, and subsequently, when the Prussians did come, as a means of escape from arrest, the fisherman related what had so much astonished him on the occasion of Richard's midnight visit, and the cable was consequently destroyed.

Some daring operator proposed to risk his life and test the cable at the broken part by fishing up the terminals and telegraphing with his tongue, and afterward connecting the broken conductors. The proposition was fraught with so much of danger and had in it so little promise of success, that the scheme was abandoned.

Theory was now the basis of another project. If electric current enough could be thrown into the Seine, would not that be capable of deflecting a galvanometer at the farther terminal?" was asked, and answered, "Yes, if the whole body of the river could be inclosed and insulated."

Out of this came a proposition to place floating metallic discs for terminals in the stream, with galvanometers in the circuits between these and the shore. The experiment was tried through the river, a distance of 20 kilometers, and resulted satisfactorily. Mountains of hope were raised from this small germ.

M. d'Almeida, a professor at the Lycée Henry IV., was selected as the proper party to arrange the distant terminal of the line, and accordingly, three days after his appointment, the intrepid scientist departed by balloon from the passenger depot of the Orleans Railroad, at 1 o'clock at night.

The balloon landed safely, and now commenced the second stage in the procedure, the working of their way—the professor and his companions—to the point of destination. Traveling principally at night, in constant danger of apprehension, and no one could tell what—if discovered, they reached Nevers in five days, successfully eluding the enemy, through the aid of tried friends to whom they dared let their mission be known. Arrived at Tonnerre at 2 o'clock one morning, they found that the city was occupied by the enemy, and they were at once brought before the Prussian commander, whom they wheedled into the belief that they were harmless. Thence working their way to the chief of the postal and telegraph department, they commenced to divulge the object of the journey. The official broke in upon the speaker with, "Take all this away from me!" in a tone which the writer compares to the explosion of a gun. Disappointed, they again sought a hiding place, and finally, after passing many sentinels, they at last were housed in a hotel filled with soldiers, where the stables were overflowing with the enemy's cavalry. "I slept," says d'Almeida, "quieted by the resonant snores of two German officers, one of whom was a military telegrapher!"

They continued their route, dodging between moving regiments, hoodwinking patrols and disarming by cunning artifices the most inquisitive suspicions, until finally they reached Lyons, where they were enthusiastically received by Gambetta, and finally arrived safely at Poissy—the point chosen for the experiment—with 1,200 cells of battery.

The placing of the floating plaque and making connections to the shore, was of such a mysterious nature that the work was all done at night, to avoid suspicion, and prevent the assemblage of wonder-mongers who would naturally gather around such a demonstration.

The end was near, and poor, dying, discouraged Paris was about to be once more united to its friends and fellow patriots outside the walls. Ah! it was too late! The fatal 22d of January had overtaken the enterprise before its accomplishment, and the starving citadel had capitulated; but the devotion of M. d'Almeida and the brave companions of this forlorn hope of patriotism and telegraphy will never be forgotten by the nation they labored so faithfully to aid in the days of her saddest gloom!

Wealth in Waste.

MILLIONS OF DOLLARS TO BE SAVED AND RECOVERED BY A SIMPLE APPLIANCE.

A correspondent sends the following from Carbondale, Pa:

As near as any one can calculate, there are heaped in the anthracite coal regions of Pennsylvania not less than 150,000,000 tons of mine waste. This waste is called culm. Everywhere in the coal country it meets the eye in black mounds that cover acres, and rival in dimensions and height the surrounding hills themselves. The land occupied by these unsightly upheavals in Lackawanna, Luzerne, Carbon, Lehigh and Schuylkill counties, would make another county. To carry this waste from the breakers and dump it requires miles of railroad track and thousands of men, boys and mules. A low estimate places the cost of carrying and dumping culm in the region at $20,000 a day, besides the interest on the cost of the dumping grounds, which is many thousands more.

At the present time fifteen per cent. of the product of the mines goes to the culm piles. For the first forty years of the anthracite business the percentage of waste averaged more than double that, for crude and imperfect methods and appliances in mining, breaking and screening were unable to save from the waste heaps coal that is now the most profitable of all the different kinds on the market. It is only about fifteen years ago that chestnut coal began to be saved from the culm, and it was then estimated that not less than 7,000,000 tons of that size coal, worth about $25,000,000, were buried in the accumulations of mine débris. Several years ago improved screening produced a size of coal which was given the name of pea coal. It rapidly became a successful rival of chestnut coal for stoves and grates. Then the mine engineers calculated that the culm piles had swallowed up five or six million tons of pea coal, worth ten or twelve million dollars.

A year ago the Delaware and Hudson Canal Company succeeded in separating from culm at the breakers a coal still smaller in size than pea coal. This was called buckwheat coal, and it was found that it was just what the Hudson River steamers wanted for their boilers. It could not be screened with sufficient facility to make it profitable, because the coal, in coming from the mines to the breakers, is so damp that the dust clings to the finer fragments, and they cannot be cleansed by the ordinary processes of screening. The fact was made clear, though, that there was still a size of coal going to waste which, if it could be separated from the culm, would be worth a million dollars a year to mine owners. Inventors had been for years striving to devise some plan by which culm could be handled and disposed of more quickly and economically. Mine owners had spent thousands of dollars in furthering these efforts.

After the discovery of buckwheat coal the importance of a practical method of overhauling old culm piles to recover the wealth in coal buried there gave a new impetus to the inventive genius of the coal regions. Ransom T. Mitchell, of Bradford, has at last solved the problem. He has secured patents on applying the use of the air blast to coal waste, in connection with conducting pipes, in such a manner that he can carry culm from the breaker to the dumping ground and to any desired elevation. The air dries the dust on the minute fragments of coal as the mass passes through the pipes. At the dumping ground the culm is delivered into screens, where the dust is then easily separated, and every particle of coal, however small, is made merchantable. Besides thus absolutely abstracting all the coal from the culm, the air blast removes the waste from the breaker to the pile at one tenth the cost of mule and car power, a saving of about $6,000,000 a year in the working cost of that branch of coal mining.

Mr. Mitchell's method simply consists in setting up a blower of sufficient power at the breaker, and connecting it with the pipes, which not only carry the culm away from the breaker, but at the same time draw out the sulphurous mine gases and replace them with pure air. Mitchell's patents also cover the overhauling and sorting of old culm piles by means of the air blast, by which the millions of dollars' worth of coal buried there may be recovered at one-quarter the cost at which the same quantity could be mined.

A practical test of this Mitchell air-blast in handling culm was made the other day at the Pennsylvania Coal Company's breaker No. 5. The success of the test was complete. Several large companies are making arrangements to use the appliances at their collieries. Mitchell has refused an offer of $500,000 for his patents. He says that as they have made a lot of hitherto valueless and unsightly heaps of coal dust worth $30,000,000, and have made it possible to dispose of culm at an annual saving of $6,000,000, they are worth a great deal more money than any one can give him for them.

The Bleichert Wire-Rope Tramways.

Last week we referred to the progress this system of tramway has made since it was introduced twelve years ago by Adolf Bleichert, of Gohlis, Leipzig. Up to the present more than 250 plants have been supplied, the total length being 260,000 meters, of which 122 plants fall to mines and smelting works, with a length of 175,000 meters; 11 to quarries (13,600 m.), 22 to brick works (21,600 m.), 26 to sugar manufactories (17,400 m.), 8 to chemical works (5,730 m.), 21 to building undertakings (14,180 m.), 4 to spinning and weaving works (750 m.), 19 to cement works (6,800 m.), 5 to paper works (1,400 m.), and 11 to various establishments (5,400 m.) Naturally, the country of its invention has most extensively adopted this system (190 plants), but all other countries have equally acknowledged its high value. Among the foreign countries A. Adolf & Co. have supplied, are Russia (12 plants), Austria-Hungary (11), Belgium (9), Italy (8), Australia (5), Switzerland (3), France (3), Sweden and Norway (3), Holland (1), Spain (2), Roumania (1).

A proof of the high estimate placed upon this system is seen in the fact that renowned firms both at home and abroad have given repeated orders for further or more extended plants, after thoroughly satisfying themselves as to their solidity, efficiency and economical working. To show the saving which may be effected by using wire-rope lines as a means of transport, we may mention the fact that at the Douglas lignite works "Alfred," at Tornitz, a length of 3,000 meters was built in place of a narrow-gauge horse tram way, and by this means the costs of transport were reduced to a quarter of the former amount. Lately, too, it has been shown that the Bleichert wire-rope lines can compete with normal gauge railways, since one of the first smelting works of the Saar district has been supplied with a three-kil. long wire-rope line, by means of which to transport its daily coal consumption of 70 D. W.—formerly conveyed by a normal-gauge locomotive line—and the saving is so great that it has paid the total cost of the line in little more than a year.

Particularly interesting among the German plants is that of the Buderuss Iron Works at Lollar (Nassau), which connects the extensive collieries with the railway and the smelting works. Two main lines, of 10,500 m. and 3,820 m. length, send off in all directions nine branches, which run to one length of 1,300 m. On this line of 19,865 meters, altogether 1,600,000 kg. of material are forwarded daily without difficulty. A wire-rope line, supplied to the Rima Murany Salgo Tarjaner Eisenwerks Actiengesellschaft, at Buda-Pesth, is also of considerable interest. With a length of 13,000 m. and a daily transport of 500,000 kg., an extremely hilly piece of land, with enormous undulations, large hollows etc., is overcome; several rivers and twelve highways being crossed, while many large depressions are spread along the whole route. Another noteworthy wire-rope line, constructed by A. Bleichert & Co., is one for F. B. Rochert & Co., in Bilbao, for the transport of ironstone from the mines to the railway, the length being 1,840 m. with a fall of 227 m., the maximum fall on longer lines being one in three. Amongst the lines just supplied is a system, consisting of four lines, for the Mansfield Cupriferous Slate Company, at Eisleben, which, with a length of 3,205 m., carries 1,400,000 kg. of slate and coal daily by means of a 13 horse-power engine—a result which, in view of the difficulties of ground could hardly be attained by any other system. The many successful cases in which this means of transport has been adopted show the great importance of the Bleichert system of wire-rope tramways, to which we have pleasure in according our word of praise.—*Kuhlow's Berlin, November 11th.*

The Young Woman and the Telegram.

The other day a young housewife left her home in Cincinnati to spend a few days with several lady friends in Hamilton. Before going she provided a good supply of cold edibles for her husband, and told him that he could help himself whenever he was hungry. He took lunch down town and went home in the evening for dinner.

As he tells the story, he found cold chicken, cold butter, cold pie, cold milk, cold salt, cold mustard, and several other cold dishes, but with all that he was not entirely satisfied, and hunted high and low for something else. At first he did not know what it was, but finally concluded that he wanted bread. He knew there was some in the house, but he could not find it. Finally he concluded to telegraph his wife, for he could not live without bread. Accordingly a telegram asking "Where is the bread?" was dispatched.

The wife received it in the midst of a number of ladies, and it frightened her nearly to death. With the cry, "I know it is bad news; I know Mr. B—— is killed!" she fell in a faint. The ladies present cried from sympathy, and a most lugubrious scene presented itself when the man of the house happened in. "What's the matter here?" he asked. "Mrs. B.'s husband has been killed and she has fainted," was the reply. "How do you know?" he asked. "Oh, she got a telegram." "Where it it?" "We haven't opened it yet."

Imagine the scene when the sympathetic creatures read the message. In about an hour the reply was sent back to him: "You mean thing. It's in the bread box, under the piano, where I hid it from the cook."

—— Jacksonville, Fla., is to have the incandescent light introduced into her factories and other large buildings.

Objecting to the Electric Light.

THIEVES DON'T LIKE IT—IT DISCOURAGES IMMORALITY—CORNER LOAFERS AGAINST IT—IT DISTURBS THE POLICEMAN'S DREAMS.

Commendation of the electric light is so frequently heard in our city, that many people may not be aware of the strong opposition to it which exists in many quarters. Chief Willard, of the police force, in conversation with an *Express* reporter the other day, made some of these objections very clear. "I am not prepared to say," he replied to an inquiry, "to what extent the lighting of the streets has diminished crime in this city. You could not tell very well by comparing the number of arrests under the new system and the old, because a crook is much more likely to fall into the hands of the police at night now than formerly. Thieves are very warmly opposed to the electric light. A man with a bundle of 'swag' can be seen at night several blocks away. Crooks from other cities complain bitterly of the electric light. Formerly they could easily escape recognition at night in the dim light. The shade of an old slouch hat was sufficient to conceal their features from identification. Now we spot them very easily and promptly."

AN INDUSTRY PARALYZED.

"Perhaps," continued Chief Willard, "the class which most strongly objects to the electric light is that which fills the disorderly houses of this city. The light hurts the business of street-walkers in more ways than one. These women incur much greater risks of arrest now than formerly, because it is much easier to watch their actions. Men who desire to maintain a respectable reputation are also deterred from responding to the attentions of the fallen. They can never tell when they will be unexpectedly detected by friends and acquaintances, or by the police. The streets where the women live are so well lighted that visitors incur a great risk of detection. Many favorite meeting places up-town are broken up because the street corners are flooded with light." The chief mentioned several localities where electric lights have been placed much to the disgust of those whose deeds love darkness rather than light. Captain Davidson fully concurred in these observation.

LOAFERS DOWN ON THE LIGHTS.

Another class which is completely disgusted with the introduction of the electric light, consists of those who either insult passing women from motives of sheer innate cussedness, or for plunder of the defenceless. "Why," said a gentleman in the dry-goods line, "the increase of our evening trade has been very great since the introduction of the light. Ladies are not now afraid to go out in the evening unattended. They are no tmore liable to insult or attack than in the day-time. Consequently, those who find it inconvenient to do their shopping before dark do not hesitate to come and make their purchases in the evening." The light is, therefore, very unpopular with hoodlums, garroters and sneak thieves.

A QUEER OBJECTION.

One of the most singular objections comes from a stockholder in the Albany railway. "I think the electric light is a nuisance," said he, "because it interferes with an established business." "How so?" "Simple enough to explain," he responded: "it diminishes the receipts of the uptown tram way line very seriously. A few years ago a lady would not have attempted to walk many blocks in the night time, so she was obliged to patronize the street cars. Now she is no more afraid to walk at night than in day time, and our receipts from night travel have fallen off very seriously." "Well, I never," ejaculated a bystander.

IT INTERFERES WITH HIS COMFORT.

"How do you like the electric light?" was asked of a burly policeman the other evening. "Don't like it for a cent," he responded gruffly. Pressed for his reasons, he said; "It is hard on the eyes." "Harder than daylight?" "'Bout the same; keeps a man wakeful. Now that ain't nateral. The night was made for sleep. All the animals go to roost at night, and so ought men, too." His interlocutor, wrapt in thought, pursued his way, reflecting on many things.—*Albany Express.*

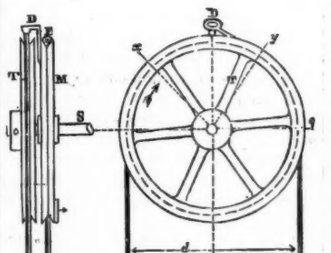
Electric Locomotion.

BY A. RECKENZAUN.

IV.

Various modifications of Prony brakes have been introduced from time to time, but such modifications are merely in the details of construction. Fig. 2 represents one of the author's design; the pulley is provided with adjustable jaws of steel, tightened up by means of screws in a manner similar to the chuck of a lathe; an American chuck with three jaws, moving simultaneously, would be still better, as it allows of a speedy and accurate adjustment to various sized spindles, thereby removing the necessity of keeping as many pulleys as there are spindles of different diameters. In this brake, the upper half of the pulley only carries a wood block, and the lower part has a steel band which is pressed against the pulley face by means of levers hinged upon the wood block; the levers are worked through two nuts and a right and left hand screw, fixed upon the central hand wheel. The pressure can by this means be adjusted with greater regularity than in the case of plain bolts and ordinary tightening nuts. For the purposes of lubrication, the lower part of the pulley with the steel band may dip into a trough containing soapy water. The lever is balanced by a counterweight, and it is bent downwards to increase the stability.

FIG. 2.—RECKENZAUN'S "PRONY" BRAKE.



FIGS. 3 AND 4.—PROF. JENKIN'S BRAKE—BALANCE WEIGHTS SHOWN BY ARROW HEAD—THE WEIGHT OF D.

In order to render the coefficient of friction, or the pressure between the friction surfaces, automatic, within certain limits, several ingenious devices have been invented; amongst these is one by the late Professor Fleming Jenkin, another by M. Raffard, one by Professors Ayrton and Perry, and others. Professor Jenkin's brake is shown by Figs. 3 and 4; it consists of two pulleys of equal diameters; the pulley, *M*, is loose upon the motor shaft, *S*, and pulley, *T*, is fixed to the shaft by means of a key, or an adjustable clutch. Pulley *M*, carries two cords, *P* and *p*, preferably of leather; cord *p*, is held by an eye *F*, in the middle of the rim, and cord, *P*, is supported by a bracket, *D*, which is fastened to *M*. When *D* stands vertical with reference to the center line of the spindle, then each cord embraces about a quarter of the circumference of it's own pulley. The requisite friction between the cord, *p*, and its pulley, *T*, is obtained by suspending weights, *P* and *p*, on the free ends. On setting the motor in motion (in the direction of the arrow), the cord and weight, *p*, will be pulled downward, by the adhesion of the cord, and the bracket, *D*, will swing round toward a new position, *Y*, or beyond it, the frictional surface being thereby diminished; now, in order to bring *D* to its vertical position, either *p* has to be diminished or *P* increased; whether a diminution or increase in the weight has to take place depends upon the speed at which we desire to run the motor. Supposing the weight, *P*, is too great, then *D* will be pulled over toward or beyond the point *x*, and the arc embraced by the cord, *p*, will be augmented.

It will be seen that the frictional surface adjusts itself to a certain extent, and we have merely to add or remove weights in order to establish equilibrium. If the speed is too great when *D* is in its normal position, then we have to add weights to both *P* and *p*, and, of course, proportionately more at *P*, as the friction between the points *D* and *q* must increase faster than the sum of the added equal weights. To calculate the horse power absorbed by the friction of the cord, the following formula applies:

$$\text{H.P.} = \frac{d \times 3.1416 \times (P - p)}{33000}$$

where *d* is the distance between the cords measured in a line at right angles to the spindle; *P* and *p* are the weights in pounds.

If the weights and dimensions are on the metric system, then the devisor will be as given in Article III. for the Prony brake. For the testing of motors of not more than 3 horse-power, this is the handiest dynamometer one could wish for. With the exception of the bush in *M*, which has to stand still, whilst the shaft, *s*, revolves, there is no lubrication required, if the experiment is of a short duration. In the case of extended tests, a small stream of water will keep the pulley tolerably cool. The leather cord deteriorates in a comparatively short time—it wears away; but this is a small matter.—*Telegraphic Journal and Electrical Review.*

.... The Western Union Telegraph Company expects to occupy its new quarters at Broad Street and South Penn Square, Philadelphia, in about a week. The company is greatly cramped in its present quarters, and Superintendent Gill has already been compelled to move his desk, and those of his assistants, to the new office. A new brick front has been erected, bringing the structure out to the building line. The main floor of the old building will be used as an operating room, and the galleries on either side will be set apart for clerks. The first floor of the new structure will be used as a receiving-room for dispatches and for the accommodation of messenger boys. Superintendent Gill's offices will be on the second floor, and the third will be occupied by the Associated Press. The work of moving will be very interesting, and the entire operation will be done in a few hours during the night. It will require the duplication of all the instruments at the old office, and the hanging of a complete set of new wires, which will make the operation expensive. When everything is ready the wires running into the old office will be cut and the connections made with those ending at the Broad street office.

The Value of Incandescent Lamps.

It will be remembered that the Franklin Institute recently carried out a series of comparative trials of incandescent lamps. Referring to this subject, the *Engineer* says it is to be regretted that the investigation was carried out under conditions which have deprived it of value. This is the opinion of competent electricians in this country, and was admitted at the last meeting of the Dynamicables. Our contemporary remarks that in dealing with the question of the value of incandescent lamps, it is above all things necessary to be quite clear and precise in the use of terms. A great deal of vague talk circulates concerning the lighting power and the longevity of incandescent lamps; and the general public may rest certain that they do not hear quite the worst. Putting this on one side, however, no one really knows with any accuracy, except by chance, how much light an incandescent lamp gives. Light cannot be measured or weighed like milk or beef, and the consumer is compelled to trust to the good faith of the electrician to get what he bargained for. In the case of gas it is different. The gas is tested by examiners, and when the consumer is told that he is supplied with 16-candle gas he knows that he has a Government guarantee that he gets gas of a definite quality—that, in a word, he has what the company sold to him. The testing of incandescent lamps is a far more difficult matter than the testing of gas, and the work has not yet been brought to anything like perfection. Furthermore, there is a very great difference in the amount of light given out by an incandescent lamp in various planes vertical and horizontal. Do the makers always measure them in the worst or the best position? Who will say? Leaving the question of amount of light developed by a given power on one side, let us turn to the question of longevity. On this point, again, very vague ideas prevail. Curiously enough, the condition of the lamp at any given epoch is overlooked. But incandescent lamps are, like human beings, liable to decrepitude in old age; and, just as the most decrepit men and women seem to possess charmed lives, so it is with the aged incandescent lamp. The feeble old man of ninety takes care of himself; he runs no risks. The incandescent lamp of two or three thousand hours follows this good example; it takes care of itself. It may be the worst possible economy to use long-lived lamps. Indeed, so far as is known, there seems to be a period in the lives of some incandescent lamps at which, once reached, they ought to be superannuated; but no one yet knows what is the precise period. In conclusion, our contemporary points out that there is no such thing as a good volt or ampere meter to be had in the open market. A mathematical instrument maker can send his thermometers and barometers to Kew and get them tested for a small charge. The watchmaker can do the same thing by his chronometers and watches. The pound weight and the yard measure can be verified by Government standards; but there is nothing of the kind available in a general way to electricians, and it is quite time that there was. At present, as far as incandescent lamps are concerned at all events, there is no trustworthy evidence to be had as to what their powers really are. Electricians are in the position of the earlier inhabitants of this island, who, lacking foot-rules, measured lengths in terms of grains of corn.—*London Electrical Review.*

—— The press of Bloomington, Ill., is especially pleased with the new electric lights, and many are the favorable comments published. The lighting of the city by electricity marks the beginning of a new era in the city's history, and is an index of the fact that Bloomington is keeping pace with the spirit of improvement. The era of gas-lighting lasted from 1857 almost to 1886, or nearly twenty-nine years. Before the era of gas there was darkness on the streets. How long electricity will be the source of light, is a problem that the future must solve, but a superior illuminant is not now in the imagination of any one.

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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NEW YORK, DECEMBER 19, 1885.

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The National Electric Light Association will hold its next meeting on February 10th, at Baltimore.

The gas works at Kansas City, Mo., were blown up last week, and the city left in darkness, excepting those enterprising establishments that had adopted the electric light. General Superintendent Weeks, of the electric light company, is now crowded with orders, and fully realizes what it is do a land-office business.

The Interior Department has now a small library on the subject of telephones, the briefs, evidence, supplementary evidence, and other matter connected with the telephone case already sent in filling nine large volumes. Additional matter was sent in the first of this week with the promise of more to follow, and if the Department does not now become fully informed on the telephone question it certainly will not be from lack of material and facilities.

Boston is to have an elevated railroad, the trains to be run by electricity. The road is to be known as the Boston Elevated Railroad Company, and the projectors are S. W. Chandler, Frederick O. Prince, M. Denman Ross, Bainbridge Wadleigh and others. The legislature will be petitioned at its next session.

At a meeting of the stockholders of the Telegraphic Time Company, held last week, the following named gentlemen were elected members of the Board of Trustees for the ensuing year: Alfred A. Reed, Henry Howard, C. R. Weeden, F. E. Spooner, J. W. Duxbury, C. H. Pond, James Hamblett, Henry Earle, and C. H. Wright.

Mr. C. A. Brown, Manager of the Western Electric Company, Chicago, looked in on his New York friends this week. Mr. Brown reports the rapid development of the electric lighting business in the West, and the interest in the National Association continually increasing. There will be a much larger attendance from the West at the Baltimore meeting than at any of the former gatherings. All the Chicago companies will be represented.

The verdict in the case decided in favor of the American Bell Telephone Company, by Judge McKenna, of the United States Circuit Court, at Pittsburgh, last week, is claimed to be a "meaningless verdict," and that the decision was arrived at by an agreement between the counsel of the plaintiff and defendant companies in order that the cases before the Supreme Court might be hastened. We would remark, in passing, that the Bell Company seem to have secured a goodly number of these "meaningless" verdicts.

The *Daily Graphic*, of this city, with commendable enterprise, gives a two-page illustration Tuesday, of this week, of the American System of electric lighting, showing the several departments of the company's extensive New York factory, the offices here and in Boston, dynamos, lamps, etc. The large factory of the Boulton Carbon Company, of Cleveland, the Armington & Sims engine and the Jarvis furnace, etc., are also shown in the illustrated two pages, making in all, with the columns of description, quite a valuable electric light edition of the *Graphic*.

The inquiries received at this office concerning the National Electric Light Association show an increasing interest in the work of the organization. To become a member of the association, we desire to state in reply to several queries, it is necessary to send your name to the President of the association, Baltimore, Md., with the admission fee of $10. The annual dues thereafter are $10 yearly. All voting members of the association are persons engaged in the business of furnishing electric light, and manufacturers and dealers in electrical goods can become members and have a voice in the proceedings, but are not entitled to vote.

A committee of the St. Louis Council and others from that city visited Chicago last Saturday, and inspected the underground system for electric wires and cables in use by the electric companies of Chicago. The Dorsett system, which is in extensive use there, was thoroughly examined, and found much favor in the eyes of the visitors. Other systems of an experimental nature were exhibited and discussed, which brought out the opinion of Messrs. Barrett, Cushing and other Chicago electricians, strongly in favor of the system which has been in use for two years past in that city, and which had stood the crucial test of time. The delegation departed Sunday night expressing a favorable opinion of the Chicago system, and well pleased with the attention shown them while in their sister city on the lake.

In introducing his bill, on Thursday last, to provide for the establishment of a postal-telegraph system, which was referred to the Committee on Post Offices and Post Roads, Senator Edmunds said it was the same bill that he had introduced at the last session of Congress, which went to the Committee on Post Offices and Post Roads, and was reported upon by that committee so late in the session that the subject could not be considered by the Senate before the expiration of the session. He hoped the committee would now take the earliest opportunity to report on it. He wished to press it to a vote after reasonable discussion and examination. It may be, he added, that, differing from his former position on the subject, he should now be willing to purchase, at their actual value, the plants of any telegraphic company that may wish to sell them to the United States—not the value of the stock watered or unwatered—but the actual value of the materials, substance of things, lines, implements, etc., as such value may be appraised by some tribunal in which we would have confidence. Mr. Saulsbury, of the Committee on Post Offices, said that the senator from Vermont knew very well that the bill had been reported as soon as both sides had been heard, including the senator from Vermont. Mr. Edmunds replied that he was familiar with that fact, and also with the fact that the bill had been delayed by the means usually employed by corporation lawyers. With this the discussion ended, and the bill is now in the hands of the committee. It will be noticed that Senator Edmunds has receded from his former position, that of having the Government construct and maintain a postal-telegraph system, and now favors purchase of any existing plant. Perhaps he will favor leasing telegraph lines and service before he shuts out all further light, which might not be a bad thing for the Government to do, if it needed them.

"NONE OF THE GOVERNMENT'S BUSINESS."

Under the above heading we are glad to see so able a journal as the New York *Sun* express its views in opposition to Government telegraph control. The REVIEW has opposed this scheme from the first, and has, on several occasions, advanced arguments against it. The following is the *Sun's* editorial:

"That fine old Federalist, Mr. Edmunds, has again brought forward his scheme for setting up the United States in the telegraph business. His postal-telegraph bill has once more been committed to the wisdom of the Senate Committee on Post Offices and Post Roads. Mr. Edmunds wishes to bring it to a vote 'after reasonable discussion and examination.' He admits that the matter needs considerable examination.

"But there is no need of going into the question of the probable cost of plant and maintenance of Government telegraph lines, or of the proper terms of purchase by the Government of existing lines, should such purchase be deemed advisable, or of the effect of Government competition upon those lines, should they be unwilling or unable to accept the terms offered. The Committee on Post Offices and Post Roads, should it give sufficient time for thorough expert testimony on these points, would not be able to bring in any report at all.

"All this affects mere details of a plan; the thing to discuss and examine is the authority for any plan. There is no need of piling up statistics and schedules and reports and opinions as high as the Western Union building, until these questions are satisfactorily answered. What provision of the Constitution authorizes the United States to carry on the telegraph business? To the carrying out of what power is it necessary for the Government to run the telegraph business? Why is a Government monopoly preferable to any other kind? If the Government is going into the telegraph business, how long before it will absorb the railroad business likewise? If it takes the telegraphs, why should it not take the mines, the factories, foreign commerce?

"For our part, we have always understood that the business of the United States is to mind their own business."

GENERAL WESTERN NEWS.

Our first blizzard this season came quite unexpectedly on the 4th instant. As a preliminary argument the air was suddenly filled with snow flakes of the most gigantic dimensions, continuing until the ground was white. Then came a thaw which left every foot of earth a foot of mud. At early dusk the snow commenced again, and the wind set in to blow furiously, continuing until near morning. Wires were tangled, some were broken, and the electric light plant in Lincoln Park suffered in divers ways, until it was finally found impossible to run it longer, as four poles had been blown down, and about 8 P.M. the engine was stopped. While the Park people knew much damage was being done on their lake front, the absence of light prevented their taking any precautions, or applying any remedies to the mischief.

There is no reasonable excuse for these wires being run above ground. The soil of the park is all of a nature to render the running of these under ground with perfect ease, and, until this is done, there is little probability of the plant ever working successfully. As this, like the other parks of the city, is in the hands of the Park Commissioners, the city has no control, and, of course, the underground ordinances cannot compel such a suggestion. The amount of damage done to the Park Lake shore drive is about $5,000.

The storm prostrated something like seven hundred telephone wires within the city limits. East of Chicago, and particularly between Buffalo and New York, the storm seriously affected the working of the telegraph lines. The storm wound up its varied exhibition on Wednesday, after having given us a perfect weather variety show, with a grand *finale* in the shape of a regular thunder storm just before sun rise.

The Lake Electric Lighting Company, of the town of Lake, in this county, was incorporated on the 9th instant. Capital, $30,000. The incorporators are John C. Wilson, George F. McNight, and Irus Coy.

Miss Nettie M. Woodman, an employe in the Oakland exchange—one of the Chicago Telephone Company's offices—committed suicide by drowning on the 4th instant, about noon. She had been suffering from despondency, and said to a companion she would take a walk to the lake, and see if she couldn't drive off the blues. She went immediately to the water, and plunged in. The body was almost immediately recovered, but life was extinct. No cause is assigned for the act save that of depression consequent upon a feeble condition of health and dread of being compelled to abstain from labor in consequence.

In the matter of the Board of Trade Telegraph Company's troubles, mentioned in last week's REVIEW, the consultation between Judges Blodgett and Moran, resulted in the continuance of L. D. Parker, as receiver of the company.

The Central Union Telephone Company's wrestle with the Indiana State law is gradually progressing toward a finality. The case is in the State Supreme Court, and the arguments in the case will all be in by the 15th instant.

In the interim the company is collecting its rentals, with a stipulation in the contract providing for a rebate of the excess, in case the law is declared constitutional. In the matter of toll service the company is not making collections, but accepting due bills, while waiting for the verdict.

The company has shown that under the law, if compelled to accept its rates of rental, its loss, per annuum, in the city of Indianapolis, will be about $13.85 per subscriber, while throughout the State the average loss will be about $9. These figures are based upon the business of 1884, and show to a certainty what the result of an enforcement of the Indiana law will be—a with-

drawal of the telephone company from the State; and following this, a grand halloo on the part of the law makers and citizens, then a repeal or amendment of the edict, and at the last, peace. It cannot well be otherwise, for the good people of Indiana will hardly be deprived of the telephone privileges at this late day, and it is almost equally certain that proposed enactments of a similarly oppressive character in other States, after this experience, will fall still-born.

It is rumored that the millers of St. Paul and Minneapolis are about to build a line of telegraph from Duluth through the above cities to Chicago. Their assigned reason for this move, is that discrimination is made by existing companies against those places in favor of Chicago—rates being only half as high from the latter point to Eastern cities. They claim to believe that lines can make money on a much reduced tariff. The Chicago outlet, it is rumored, is to be *via* the Baltimore and Ohio.

A new application of electricity has just come to light. In a certain town in Indiana an ingenious butcher arranged an electric bell connected with a push-button concealed behind the cashier's desk. The butcher informed his customers that by means of an invention he had made, it would be impossible for any one in his absence to even touch a piece of meat in the shop without the bell notifying him of the act. The thief-catching bell proved a great attraction, and the mystery was only partially solved by an aged granger, who said he didn't exactly understand how it was done, but he did know it was electricity. Said he, "I always know when that's around for I am *very susceptible* to it—very!"

The Chicago Telephone Company has opened exchange connections with Blue Island, a suburb of Chicago, sixteen miles distant on the Rock Island road. The town has about 1,800 inhabitants.

Dr. A. de Bousset, of this city, is the originator of a new form of air ship, in which a metal cylinder, partially exhausted of air, will take the place of the usual inflated textile gas holder, and the propelling force is to be an electric motor. The untold portions of the description are inventor's secrets, but he claims that when his plans are fully matured he will be enabled to displace nearly 4,000,000 cubic feet of air per minute, and attain a velocity of 120 miles per hour with the weight of 200 passengers or their avoirdupois equivalent!

Another electrical bullet "got loose"—in New Orleans this time—on the 7th inst. The Bell Telephone Exchange was set on fire, as is claimed, by a light wire. The current ran into the exchange, setting fire to the coverings of all the office wires, and in a few seconds destroying these for use. A large force of wire men was put to work at once, and it was expected the lines—about one thousand in number—would be in working order by morning. A correspondent says: "The city is being overrun with a network of wires, in which electric, telegraph, and telephone wires are very closely mixed. Several lines have already been lost by contact with electric wires, and more than a dozen fires have occurred in the same way. A council committee is considering a proposition to order all electrical wires underground." The nomenclature is peculiarly that of a newspaper scientist.

Omaha, too, has had an experience in the same line within the last week. In this case the electrical burglar broke into the fire-alarm office through the window and had its little spree among wires and instruments in a very indiscriminating manner, paying particular attention to a fire-alarm repeater—that instrument which Sir William Thomson claimed to be the most perfect combination of electrical and mechanical ingenuity he had ever seen. It is an instrument which affords splendid facilities for the vandalism of electric light currents.

A danger in a new direction has just been mentioned—one which has not, to the writer's knowledge, ever before been brought to the attention of electric-light men.

The late Prof. Tobin, of Louisville, Ky., in a lecture before the Millers' Association at their meeting in Chicago, some years since, by an experiment in which he used an invention of his own, and which he called his "flour gun," showed his audience that with the best or poorest samples of flour he could produce an explosion by a mere spark. To do this it only required to thoroughly mix the air and flour in a box or other receptacle, and discharge an electrical spark through the mixture. His "gun" consisted of a cubical box with a capacity of a couple of bushels, perhaps. Into this he threw a handful of flour, and by means of an agitator filled the box with a cloud of flour dust. The open mouth of the box was only covered with a sheet of newspaper. A spark from a Holtz machine fired the gun with a report which was astonishing.

Not only was flour used as ammunition for the Professor's artillery, but the comminuted dust of wood factories acted in the same manner, and other inflammable dusts were found equally available.

The mysterious mill explosion at Minneapolis about that time was thus quite philosophically explained by Prof. Tobin.

Now, to return: The question has been asked, is it possible for the present soft metal safety strip of an incandescent system to produce an explosion in any factory where any of these inflammable dusts are constantly filling the atmosphere, and, if so, what is the remedy? To which the interrogator makes reply: "Use my safety strip, which is so constructed that while equally effective in every way, is positively safe in any atmosphere," and then the provoking fellow refuses to tell or show what he has with which to produce the results he claimed to have accomplished. His reticence proves conclusively that he is not an electric light man, but a philanthropist.

The county commissioners have been carefully over the five plants lately installed for them by the United States Company, and so far as an outsider can learn, seem well pleased with the result.

"For goodness sake don't say I told you," but just as soon as the present telephone circus is over, it is rumored, that a new claimant to the great, only, and original protoplastic telephone will come to the front. The inventor is a well-known American electrician, and his claims are at once startling and convincing, based upon a simple, but effective little instrument utilized by plug operators and "*l'enfant terrible*," in France, under the name of "frog." During the last century it was known in this country as the "snapper sounder," when its use created much noise, and operators possessing these were known to do very rapid work when driven by managers and superintendents. It only requires the slightest variation in form, the addition of an electro-magnet and a secondary coil with a carbon attachment, to form of this a complete Reis-Drawbaugh-Pan-Hop-Dol-Kins-Bear telephone. Some "uncredited clippings in the archives of Judge Advocate Dam," show that the

"Oh, Hello! Oh, Hello! Oh, Hello!"

so much used at the present time in telephoning, was coeval with the use of the "snapper sounder." This evidence comes not from one but dozens of witnesses, who will testify to the fact in the most positive manner, and such evidence must bear weight in the case.

It is not discreet to give the Bell folks the full benefit of the tactics in advance, but enough has already been said to show how strong a case this last Tichborne will make when "the great day comes." It is tolerably positive that this will be the last, as it is the greatest telephone interference case, and, as it is not based on sales of stock, but solely on priority and merit, only one conclusion can be reached by a fair and impartial hearing. The matter will come to a head on the first of April next.

On Saturday morning the Grand Pacific Register showed the arrival of a committee of gentlemen from St. Louis, comprising 30 members from the two branches—Council and House of Delegates—of the municipal legislature. In addition to the above, which included the clerks of both bodies and the speaker of the latter branch, there were 15 gentlemen, among whom were Chief Lindsey, of the Fire Department; Supt. of Fire-Alarm Hilgendorf; Murray, Electrician and Inspector of the Street Department, who looks after the light wires, and some newspaper reporters, besides several outside assistants, the entire party numbering forty-five, all told.

The object of the mission was information relative to conduits and underground systems. The procession, after going over the ground and examining the Dorsett system, piloted by Mr. Dorsett, assisted by a city official, marched back to the Grand Pacific and organized an informal meeting for the discussion of the two systems presented—the Dorsett and the Chisholm-Patterson.

Messrs. Sperry, Electrician of the Sperry Company; Haskins, Electric Light Inspector; Prof. Barrett, City Electrician and Superintendent, and Cushing, Superintendent of the Sectional Underground Company, were each asked to state their experiences and knowledge of the various underground systems in use in Chicago, a request which was cheerfully complied with by the several parties mentioned.

An attempt was made to badger and cross-question the gentlemen, to elicit, by a species of criminal-court interrogations, some disparaging statements with reference to the Dorsett system, and thus aid the other party. The animus of this proceeding was so apparent that the chairman of the meeting put a decided check upon it by stating that the object of the meeting was to obtain information, not to promote ill feeling or countenance any unfairness; and he ruled that, inasmuch as gentlemen had acceded to the request of the committee to give their experience in underground matters, they should be permitted to have their say in their own way. This was but fair, and the gentlemen named having concluded their little remarks, after answering all reasonable questions, the Chisholm Patterson people were permitted to say their say in the same manner.

At the close of the afternoon session, for there were two, the entire party, at the invitation of Mr. Patterson, of the Western Electric Co., visited the extensive establishment of that company, and were inducted into the methods of cable and underground work as practiced by them.

In the course of the forenoon ramble the party, under the convoy of Chief Swenie, of our Fire Department, were shown the city hall, council chamber, etc., and made a call on the Mayor. The council chamber particularly pleased them, and many were the encomiums bestowed upon it by our Southern friends.

As to the selection of an underground system for use at St. Louis, there was probably no final action taken here. From what was shown of the adaptability of the Dorsett material to all kinds and localities of work, and the fact that the work has been so thoroughly satisfactory here, where time, which is the best test of all systems, has shown its many excellencies, it is not improbable that the Dorsett system, with all the late improvements, placed beneath the sidewalks instead of under the roadway, may be the system adopted by the committee.

One thing is certain; there is plenty of ability and lots of nerve in the committee, and their investigations were thorough and searching. If they do not come to a perfect and satisfactory understanding it will not be the fault of the advocates of either system, nor for want of intelligent information furnished by the disinterested parties named above. In the language of the prize ring, "May the best (system) win."

Col. Lynch, at 144 La Salle, reports telephone stock values as follows:

Chicago	$375 @	$406
Central Union	51 @	53
Michigan	65 @	67
Iowa Union	18 @	20
Great Southern	25 @	27
Colorado	18 @	20
Rocky Mountain Bell	40 @	45
Mo. & Kas.	55 @	57
United	15 @	16
Cumberland	70 @	75
Wisconsin	110 @	112

CHICAGO, Dec. 14, 1885.

ELECTROLYSIS.

A PRACTICAL TREATISE ON NICKELING, COPPERING, GILDING, SILVERING, THE REFINING OF METALS AND TREATMENT OF ORES BY MEANS OF ELECTRICITY. BY HIPPOLYTE FONTAINE. TRANSLATED FROM THE FRENCH BY J. A. BERLY, C. E., A. S. T. E., ETC. E. & F. N. SPON, LONDON AND NEW YORK, 1885.

With the recent general progress in matters electrical, the galvano-plastic art has kept equal pace, and its applications are increasing daily in scope and importance. Not only is electrolysis now applied in the fine arts, but its use is being extended to the refining of crude metallic products and the treatment of ores. Hundreds of tons of refined copper, for instance, are annually produced by means of electric action.

In this excellent treatise M. Fontaine enters quite thoroughly into the subject of the electro-refinement of metals and in the matter of its application to copper he summarizes as follows:

The refining of raw copper by means of electrolysis necessitates much space, considerable sums of money and is a very expensive process. It is only just to add that raw coppers generally contain a small proportion of gold and silver and the cost of refining is often compensated and even more by the value of the sub-products; on the other hand the copper is much purer than that obtained from metallurgical treatment, and its high conductivity renders it a much more valuable metal.

It is unnecessary to enter into the vast importance to the electrical world, of this improvement in the conducting power of copper.

The work commences with several preliminary chapters on the elementary physics of the subject, containing also a number of valuable tables. Electro-generators are there treated upon with an excusable bias in favor of machines blessed with Gallic paternity.

In France, electro-metallurgy is extensively carried on, and the machines of the Gramme type are largely used. To give an idea of the importance of the industrial revolution accomplished by the introduction of this machine into electrolytic operations, We give the following extract from the text of a lecture delivered before the International Congress of Electricians in 1881 by M. Henri Bouilhet, chemist of the prominent firm of Christofle & Co.

With the battery the kilogramme of silver entailed an expenditure of 3.87 francs for the galvanic current.

With the Gramme machine, taking into account the value of the motive power, the interest of the capital and the wear and tear of the material, the cost of depositing silver is reduced to 94 centimes per kilogramme, (0.94 franc).

On the subject of the efficiency of plating machines, M. Fontaine attacks the old claim and insists on the authority of a series of extended experiments that it is impossible to construct a machine giving its maximum of watts, considering the weight of the materials used in its construction when closing the circuit on an external resistance equal to its proper resistance. Nickel and gold and silver plating are in turn taken up quite in detail. Coppering and electro-plating and electrotyping are fully and happily treated upon, and in this connection it is interesting to note that all the lamp-posts of Paris are coppered by an ingenious process invented by M. Audray.

The treatise concludes with a chapter on the treatment of ores by electrolysis. This is a volume which recommends itself to the manufacturer, for whose use it was particularly designed, and we are pleased to state that it has the merit of being original in a great measure and thoroughly practical.

Telephonic News

*** Kansas City (Mo.) Telephone Exchange increased forty-eight subscribers during the month of November, making 1,250 in all.

*** The Roberts new permanganate battery is being tried with marked success by the telephone people, who find it particularly adapted for their work.

*** The New York and Chicago Telegraph Company, capital $1,000,000, has been incorporated. Its object is to build a telegraph line between New York and Chicago.

*** At Raleigh, N. C., the extension of the telephone system is under way, and will result in making Raleigh the center of a system comprising Greensboro, Durham, Hillsboro, Fayetteville, Goldsboro, Norfolk and places intermediate.

*** The copper wire trade of the Bridgeport Brass Company is continually increasing with the telephone people. For long-distance work it is particularly popular, as are all the goods manufactured by this reliable and enterprising company.

*** The American Telegraph and Telephone Company have contracted, in all, up to the present time, for 3,300 miles of hard-drawn copper wire to be used in their long-distance telephoning between New York and Philadelphia. The wire was furnished by the Western Electric Company.

*** In the United States Court, at Pittsburgh, Pa., last week, in the case of the Bell Telephone Company against the Western Pennsylvania Telephone Company, Judge McKenna decided that the defendant's instrument was an infringement on the Bell patent, and granted a perpetual injunction, as asked for by the Bell Telephone Company.

*** An extraordinary feat in telephoning is reported as recently accomplished between St. Petersburg and Boulogne, a distance of 2,465 miles. Conversation was kept up, notwithstanding a rather high induction. The experiments were made during the night, when the telegraph wires were not at work. The Russian engineers hope to succeed in conversing by telephone over a distance of 4,665 miles.

*** Mere individual wealth is no longer to be feared, but the impersonal power of a corporate monopoly is the shape that the danger has taken which our era of great fortunes and rapid development has brought. A sudden change in the legal status of the Bell Telephone Company would cause greater financial excitement than the death of Mr. Vanderbilt, and the existence of the Standard Oil Company is a more important fact than his late possession of the largest private fortune in the world.—*Brooklyn Union.*

*** In deciding the suit brought by the Baltimore and Ohio Telegraph Company against the Bell Telephone Company, of Philadelphia, Judge Arnold delivered an opinion settling, for the first time in the State of Pennsylvania, several important principles of the law relating to modern electrical inventions. The telephone company refused the application of the telegraph company for a telephone to the main office of the latter company, on the ground that, by the terms of the contract with the American Bell Telephone Company, it was prohibited from furnishing telephones to be used in connection with the transmission of telegrams to any company other than the Western Union Telegraph Company. Suit was brought in Common Pleas Court, and a mandamus was prayed for requesting the telephone company to furnish the desired facilities to the complainant. A writ of peremptory mandamus was awarded.

*** New halliards had to be reeved on the flag-poles on the capitol at Hartford, Conn., a short time ago, and this was done easily in all but one case by splicing the new to the old halliards, and thus getting the new in the place of the old. On one flag-staff, however, the halliard had broken, and it was necessary for somebody to go aloft with the new line and put the end through the sheave. Nobody about the capitol felt anxious for the job of mounting into space with nothing to embrace but a flag-pole, and sure death in view if any accident happened. In this dilemma, Mr. Frank E. Scoville, of the Southern New England Telephone Company, was called in, and climbed the pole as calmly as if it had been an ordinary telephone support, rove the halliards and descended.

*** Mr. Fred. H. Angell, a well-known and active member of the electrical fraternity, has opened an office at 33 Astor House, New York, and will represent the Detroit Electrical Works as Eastern manager. In a circular announcing the change, Mr. Angell says: "I beg to inform you that I have severed my connection with the American Electrical Works, and have associated myself with the Detroit Electrical Works, of Detroit, Mich., whose Eastern agency will be conducted under my management at the above address. As the productions of this well-known corporation include all lines of electrical goods, I shall be able to meet the requirements of the trade in every branch and particular. It is my intention to study the wants of each individual patron, striving to give satisfaction to all."

*** News has been received at the office of the Tropical American Telephone Company, Boston, of the consolidation at Rio de Janeiro of the Companhia Telephonica do Brazil with the Companhia Uniao Telephonica do Brazil. This latter company now controls all telephonic interests in Brazil, having only a short time ago acquired the patents and contracts of the Companhia Nacional de Electridade and Companhia de Telegraphas Urbanos. By this fusion of interests the Tropical company receives 70,000 milreis, say $30,000 in 8 per cent. debentures of the Uniao company and will supply all telephones and telephonic instruments and supplies under a permanent contract. One hundred complete sets have just been forwarded to the new company. Officers of the Tropical American say there is no doubt about the payment of dividend No. 3 next month.

*** The movement against the telephone monopoly, which was instituted by the subscribers, has fallen flat, as it was bound to when those persons who placed their names upon the paper conditionally were allowed to govern the whole. When they refused to allow their names to be published, and thus throw some weight into the movement by showing to the public what was actually being done, no one but the enthusiasts expected anything to come of it. A few of the gentlemen who voted at the meeting to order out their instruments unless concessions were made by the company, had sufficient backbone, backed up by conscientious scruples against going back on their word, to do as they agreed. The majority of them slipped out on the ground that there was nothing binding. Those who are out have obtained no satisfaction by their withdrawal, and will one by one order their instruments replaced, and probably be obliged to sign a contract. The committee has sent notifications to all the subscribers reminding them of their vote and proposed action, but nothing need be expected.—*Worcester Telegram.*

*** A very comprehensive system of telephonic intercommunication has just been completed at Sandringham for H.R.H. the Prince of Wales. An entire absence of induction effects was particularly insisted upon, and this has been very successfully accomplished by the use of specially manufactured cables, and which are laid under ground in pipes. Eleven of these cables are taken from a switch-board in Sandringham House to various parts of the estate, including the residence of Major-General Sir Dighton Probyn, the equerries' cottages, the agent's house, and the railway station at Wolferton. Messrs. Tasker, Sons & Co., of Sheffield, telephone engineers to her Majesty, have carried out the work, using their usual telephonic combination of Johnson and Bell patents, and the clearness of articulation and the rapidity with which intercommunication can be established are very prominent features of the undertaking. At the conclusion of the work, and when the possibilities of the system had been thoroughly proved, Mr. Johnson had the honor of an interview with H.R.H. the Prince of Wales, and to him His Royal Highness expressed in gratifying terms his satisfaction at the marked success of the installation.

*** Edward L. Castle, manager of the telephone exchange, is now engaged in putting in the fire alarm for the Fire Department, and in the course of three weeks he will have it completed. The work of setting the poles was begun last Monday. The plan and description are as follows: The central station or engine-house will be furnished with an apparatus called the indicator or annunciator, consisting of six drop-shutters, and numbered from one to six. A No. 12 galvanized iron wire runs from each drop-shutter magnet to the stations located in different parts of the city. These stations are equipped with a magneto bell, the same as used by the telephone company. This is intended for the calling apparatus, or where the alarm is sent in, operated by a turn or two of the crank, thus causing the drop-shutter at the engine house to fall down, showing the number of the station from whence the alarm was turned in. When the drop-shutter falls, it causes the secondary circuit to close. On this secondary circuit is placed an electric bell at each of the firemen's residences, 25 in number. These bells are run by 40 cells of Disque batteries that are placed at the engine-house. Thus, when the alarm is sent in from any one of these stations, the bells are caused to ring until some one goes to the central station and puts the drop-shutter back to its former position. The indicator or annunciator is made of black walnut, and will be finished very fine. The electric bells are three inches in diameter, nickel-plated, and of 15 ohms resistance in the magnets. The probable cost of the material and placing it in position will reach about $400, and the number of miles of wire will be six.—*La Salle (Ill.) Democrat-Press.*

*** It is six years ago yesterday since Mr John F. Noonan came to Paterson and commenced to string the wire for the first telephone. It was then considered a great curiosity. The first instruments were placed in the offices of the *Guardian* and *Press*, and the first conversation was between these two instruments. People considered it an experiment then, and no one imagined that it would meet with success as a part of the commercial and domestic machinery of our inhabitants. Now, what is the result? The telephone is such a common thing that everybody in the city has used it more or less, and it is in many private houses as well as in all the principal offices and stores. There are nearly six hundred instruments in Paterson alone. It has stretched itself out into the surrounding country, till Mr. Noonan has now under his control "trunk lines," which he has put up, to New York, Belleville, Hackensack and almost every hamlet and village in Passaic, Morris and Bergen Counties. Six years ago there was not a telephone pole in this Congressional district; now Mr. Noonan has under his charge 4,764 poles. Six years ago there was less than half a mile of telephone wire stretched in the district; now there are over 700 miles. Now we can talk with every city within sixty miles in each direction, and there has been much improvement made in the way of increasing the efficiency of the system. It cannot be said that the method of making the connections at the central office has yet reached a state of perfection, but it is fast approaching that point, and the time is coming when the connections will be made in the central office automatically. The growth of the use in the telephone during the past six years has been remarkable. Paterson's history is the same as everywhere else, for the present arrangement of inter-communication was introduced in this city simultaneously with other places. Mr. Noonan has accomplished all that has been achieved in Paterson.—*Paterson* (N. J.) *Guardian.*

Institution of Civil Engineers of Ireland.

In the course of his address, the president of this institution made the following reference to electrical matters: "Electricity, which has done so much, and with which we have expected to do so much more in various ways, has not as yet produced a storage battery which is at the same time economical and occupies but a small space. We have not as yet arrived at the time when any one can, with reasonable economy, light his house with incandescent lamps at a price which will compare favorably with ordinary illuminants; and, unless the ordinary householder is capable of understanding and attending to an engine and dynamo, he must yet wait before he can gain the undoubted advantage of the electric light at a reasonable cost. With large spaces and certain classes of buildings, the case is very different; and when the arc light can, either with or without a certain proportion of incandescent lighting, be used to give large amounts of light, it is found to be economical as compared with its older rival, gas. I would, however, point out that the direction in which even greater economy could be obtained seems to be in the production of cheaper but still reliable carbons. Unless carbons are of the best possible kind, they flicker and give off a large quantity of dust, which gets into and clogs up the mechanism of the lamps. In order to illustrate how important is the question of the cost of carbons, I may mention that in a large installation with which I am familiar the carbons cost 40 per cent. of the whole expense of working; wages amount to 30 per cent.; coal to only 14 per cent.; the remaining 16 per cent. being made up of all the smaller items of repairs, oils, tallow, waste, leather belts, etc. Those who have had anything to do with the erection of electric-lighting plant cannot help being struck with the number of German workmen who are employed in connection with this work, and it is, no doubt, due to their possessing a greater knowledge of electricity and chemistry which our own workmen have not the same facilities for obtaining; and this fact is but one of many which may be brought forward to illustrate the necessity of the establishment of technical and scientific schools in our large towns. How little has been done in England and Ireland, and how much in Germany, to foster scientific and also technical education was shown in the admirable address of Dr. Lyon Playfair to the British Association. The difficulties which exist with regard to small installations of electric light for household purposes are almost the same as those which prevent its use for the lighting of railway trains. Several experimental trains have been lit, and some of them are still running on various lines in England, with incandescent lamps. In one system an engine and dynamo is fixed on the locomotive, but the light goes out if the locomotive is detached, unless there is a storage battery in the van. In another the dynamo is driven from the axle of the van. In a third, storage batteries are entirely depended on, but nothing that I am aware of has as yet been produced in a handy, and at the same time an economical, form, which will enable any carriage to be detached from a train and carry its lights with it for a number of hours. What is required is something of the simplest possible character, easily attended to, and not demanding of lamp-men more intelligence than is now required to turn a gas tap."

*** A French chemist has brought forward a new method of manufacturing gunpowder. The requisite quantity of sulphur is dissolved in sulphide of carbon, and this solution is then mixed with the carbon, which, instead of charcoal—as in other modes of powder making—is cotton or some other cellulose fiber, which is reduced to an impalpable powder. To this mixture is finally added the proper quantity of a saturated solution of saltpetre. The compound is now evaporated and the crystallization broken up, or it is evaporated in a vacuum. A very perfect incorporation of the several substances is thus secured.

Inexpensive Fire Extinguishers.

Prof. F. S. Ledsie, of the Lansing, Mich., Agricultural College, by request, recently made some tests and experiments with a number of hand fire-grenades. One of the popular extinguishers upon being opened and qualitatively analyzed, was found to contain a solution of common salt, acetate of soda and sulphate of lime, the salt predominating A number of experiments proved that a bottle containing simply a strong brine, when broken upon burning kerosene, instantly extinguished the flames A vapor arising from the solution, spread all over the flame and put out the fire wherever it touched. They then constructed some home-made grenades, using flat bottles, bound together side by side with wire. Using two bottles in this way insures their being broken on striking the burning body, which would not always occur when only one bottle was used. Bottles thus charged with brine and bound together were broken side by side with the Harden grenades and found to be equally valuable.

There is no one too poor to provide themselves with these inexpensive fire extinguishers, nothing being needed but bottles, wire and strong brine, which, if sufficient salt be used, has the advantage of not freezing enough to burst the bottle. No more big bonanzas for the "grenadiers."—*Chicago Journal of Commerce.*

Telegraph Changes in Philadelphia.

The American District Telegraph Company has completed arrangements by which it will at once transfer its business to the Baltimore and Ohio Telegraph Company instead of using the lines of the Western Union Company. The American District has for many years had a contract with the Western Union by which it delivered messages for the latter, and in turn received dispatches at its offices to be transmitted to all parts of the world by the wires of the Western Union Company or its allied lines. For this service the American District received a commission on each message received or delivered. It became dissatisfied with its compensation recently, and made an effort to have the rate of commission raised. This the Western Union refused to allow, and the American District then gave notice that at the end of six months the contract would be terminated. Ten days ago the company notified the Western Union people of its determination to adhere to the notice, and stated that its messenger service would be withdrawn.

The American District officials state that they have secured a higher rate of commission and other advantageous terms in their contract with the Baltimore and Ohio Company. The telegraph schedule of that company—10 cents for ten words and 1 cent for each additional word—will be adopted for local business, so that in the future it will cost but a dime to send a short dispatch to any part of Philadelphia.

The Western Union officials state that they have made arrangements for conducting their own delivery system. Branch offices will be opened in different parts of the city, and, while some inconvenience may be experienced at first, it is expected that the new system will be working smoothly in a week or ten days. Messengers have been engaged.

Why the Western Union is Not Anxious for Government Business.

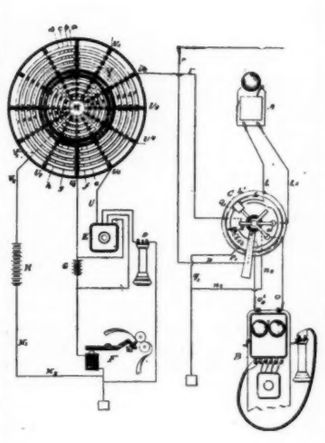
There was a crowd of telegraph operators before the Western Union telegraph office, at the corner of Fifteenth and F streets, Washington, and every man was stamping on the pavement to drown the sound of his chattering teeth.

"Well, the telegraph war is beginning to rage fiercely in the departments," said one of the shivering individuals, whose countenance was nearly invisible behind the upturned coat collar, over which a pair of well-trained Dundrearies peeped out.

"But have you heard the particulars in the matter?" he continued. "You know what a racket the Mutual Union, Baltimore and Ohio, and Postal companies are raising to get their full share in the Government business. They suppose they deal heavy blows on the Western Union by getting the Government messages for their lines. I have wondered why it was that the Western Union is doing nothing in the matter. I thought it was absolute madness, but I find that there is method in its madness, after all. I put the question to one of the officials of the Western Union. He laughed and took me aside.

"'You are a Mutual Union man,' he said, 'and, though you are on the opposition, I don't want you to give it away to the managers. It's just this: We don't want the Government business. If we could, by any means, push enough of it on any one company, we would bankrupt them in a short time. They are fighting us hard, as you know, and I hope, by heavens, they will keep it up. You know what the rates are on official business. We are sending twenty words, exclusive of date, for 20 cents for all distances within 1,000 miles, with an additional charge of 5 cents for every additional 250 miles; and we can't charge more than 50 cents for any message within the United States. Those are the rates fixed by the Postmaster General, and we have got to stick to them For instance, New Orleans, Government rate is 25 cents for ten words; commercial, 60 cents; Chicago and Portland, Me., each 20 cents for Uncle Sam, and 50 cents for ordinary individuals; San Francisco, 50 cents Government, and $1 private, while Galveston, Tex., is 30 cents Government, and 75 cents private. Do you wonder why we don't yearn after the Government business, when we can get all we can do for double the money?'

"It's too cold for me; good-bye," said the man of information, as he slipped away, and the reporter made a note in his book.



COMBINATION TELEPHONIC AND TELEGRAPHIC SIGNAL SYSTEM.

Combined Telephonic and Telegraphic Signal System.

Every one in calling a messenger, by means of the usual call box, has experienced dissatisfaction over the uncertainty that followed the call. He didn't know whether the call had been properly recorded, and, if it had, whether the "messengers were all out," in fact, if in a great hurry, would fully realize the uncertainties of the situation. An ingenious invention of Mr. J. A. Seeley, the electrician of the Metropolitan Telephone Company, of this city, is worthy of special mention in this connection, as it provides a remedy for the annoyance stated, and also gives additional value to each subscriber's telephone and messenger call-box. The invention, which we illustrate, is one that will enable the subscriber, by moving a switch, letter C in the drawing, to signal the messenger office and place his telephone set in communication with that office. And to prevent any failure on his part in answering calls that might come to him over the telephone, a small bell is put in the telephone circuit, which will notify him if any one should call while he is engaged in making known his wants to the messenger office. That the patent was not granted without a hard fight, which is quite often an indication of the value attaching to it, is shown in the fact that Mr. Seeley applied for it in September, 1883, and did not receive his clear title to the invention until December, 1885. The invention will be of particular interest to all telephone companies owning and operating their own messenger service.

TELEGRAPHIC

.... It is stated that the council of Indianapolis have voted to pay $5,000 for the use, during the life of the patents, of the Bragg & Seibert patents for opening doors and releasing horses in the fire department by electricity. The representatives of the owners asked $8,000 and declined the offer, so the account says.

.... R. Edwards & Co.'s burglar-alarm and electric-apparatus manufactory, at One Hundred and Forty-fourth street and Railroad avenue, New York, was burned at midnight, Dec. 11th. The northern half of the building, a three-story wooden structure, was completely gutted. The loss on stock and building is $16,000; insurance, $12,000. Electrical appliances for 300 buildings, including the New Cotton Exchange, the Buckingham Hotel and the Mills Building, were stored in the factory, and were destroyed by the fire. The factory is located about 150 feet from the New York Central railroad tracks, and both incoming and outgoing trains were delayed two hours by the fire.

....A metallic telegraph pole has been adopted by the Canadian government for its telegraph lines on the Northwestern prairies. The pole is constructed of malleable galvanized iron, and is 1¼ inches in diameter at the top and 2¼ inches in diameter at the bottom, and weighs less than 50 pounds. The bottom of the pole is set into a claw plate, upon which the earth is closely packed to a height of about two feet. Then another plate is put into place around the pole, and the earth packed upon it to the level of the ground. The claw plates take a hold in the ground at once, so that the pole becomes solidly fixed immediately after being set, which desideratum is only obtained by the ordinary wooden pole after it has been in the ground for at least a year. A recent test is said to have shown the great strength of the pole, as a heavy No. 6 Government wire was strung and the poles subjected to the greatest possible strain, but without moving them in the least.

.... Signor Celso Cæsar Moreno the projector of the Pacific Cable from California to the Sandwich Islands, Japan and China, is in Washington with the view of obtaining from Congress an extension for his charter, which has expired. The Transpacific cable is the last link needed for encircling the world with telegraph wires. Signor Moreno in speaking of his project, said: "The world looks to the West. In a few years a canal or two will be made across the American continent to unite the Atlantic with the Pacific. It is sincerely to be hoped that intrigues and detrimental treaties will no longer be allowed to be obstacles to commercial progress across the Pacific ocean, which by manifest destiny should be an American and Asiatic lake." Sr. Moreno said that the cable, as projected by him, to connect America and Asia, will be an imperative necessity under the new order of things that will create the happy success of the Panama and Nicaragua canals. The Hawaiian Islands, under the enlightened rule of King Kalakaua and by their exceptional commanding geographical position, will, he thinks, be an important factor in the commercial revolution of the universe which the opening of the Panama and Nicaragua canals and the Transpacific cable will bring about, and the Sandwich Islands will become in the Western Hemisphere as equally important as Singapore, Java, Borneo, Penang and Sumatra are in the Eastern Hemisphere. Sr. Moreno said the amount of money spent every year by the Government and people of the United States for sending their messages through English cables from America to Asia is larger than the interest at 7 per cent. of the capital necessary for the construction of the Transpacific cable.

.... Cincinnati is desirous of being known as the possessor of an electric street railway, and a line is proposed.

.... The Supreme Court of Arkansas has rendered a decision in favor of the Arkansas Telegraph Company, and against the St. Louis, Iron Mountain and Southern Railway Company, restraining the latter from interfering with the construction of the new telegraph line from Little Rock to Hot Springs—an extension of the Baltimore and Ohio system.

.... A rather singular incident occurred on the Caledonian Railway, near Bishopton Station, on Thursday week. When a train from Glasgow was approaching the station, one of the telegraph wires suddenly snapped and struck with great force against the side of the carriages, breaking the whole of the glass in half-a-dozen first-class compartments, and causing the greatest excitement and consternation amongst the passengers, who were numerous. Some of the glass struck a young lady in the face, and caused a slight cut on her forehead.

.... The microphone—an electric stethoscope whose sensitiveness to the faintest sounds has been described as making "the walk of a fly seem like the tramp of an elephant"—is likely to become of great use in medical diagnosis. In the Atlanta *Medical and Surgical Journal*, Dr. Eve describes an interesting series of experiments made by him with the instrument. He was able to detect the nature of obscure fractures by the character of the sounds conducted through the instrument, and could differentiate aneurisms from tumors by the sounds of pulsation. Intra-cranial and muscular sounds were made out with great clearness, and in diagnoses for stone the instrument worked with mathematical accuracy. The Doctor suggests that an audiphone constructed on the principle of the microphone would prove inestimable to people of impaired hearing.

.... Senator Ingalls has introduced a bill incorporating the Cable Electric Railway Company of the District of Columbia. It presents a plan of surface roads for the city of Washington that is bound to absorb a great deal of the local interest in the legislation of the session. The bill names as the incorporators of the new company Messrs. W. M. Galt, Charles Rayson, James E. Fitch, B. H. Warner, W. W. Dudley, C. J. Bell, J. H. Britton, O. G. Staples and E. K. Johnson. The first section provides for the laying of double tracks upon certain streets and avenues, with the right to run public carriages thereon, drawn by the electric motor or electricity in any form applicable thereto, or by the improved cable power. The bill further provides for an established rate of fare of five cents per passenger, over any and all the lines and branches of the proposed company, for the usual legal status of the property of the company, for its right to maintain the necessary steam-engines, boilers and machinery for motive power, for a standard rate of speed not to exceed eight miles an hour, and for a $50 penalty for each violation of the law in this respect, for the usual protection of the right of way of the cars and for the protection of the passengers and operatives, and for the company to have a capital stock of not less than $500,000, nor more than $2,500,000.

ELECTRICAL AND SCIENTIFIC

* * The London *Times* is valued at $25,000,000; *Standard*, $10,000,000; *News*, $6,000,000; *Telegraph*, $5,000,000.

* * Those of our readers interested in the latest works on dynamos will notice the announcement of D. Van Nostrand of their "Specialist's Series," in which are announced two new and valuable works.

* * Montgomery, Ala., desires to be lighted, either by gas or electricity. We think the City Fathers of this vigorous Southern city will agree to adopt the more modern and more satisfactory illuminant.

* * The problem of producing the semi-precious metals at a low price is now being very actively considered in France, and in this direction a small works for making magnesium has been established at Corbeil. The most suitable lamp for burning wire of this metal is now the subject of investigation.

* * Compound electric conductors, produced by electro depositing copper upon iron or steel wire, have been in somewhat limited use for several years in the United States. Recently compound wires have been submitted to the public, in which the relation of the two metals is reversed, the copper being enveloped with steel. The process of drawing such wire is said to be simple, being simply from a hollow ingot of steel filled with copper. A sample of No. 8 (.162 inch) compound wire contained 27 per cent. of copper, the total weight being 369 pounds to the mile. Tensile strength, 1,390 pounds; elongation, $5\frac{8}{10}$ per cent.; twists, 19 in 6 in.; resistance, $6\frac{26}{100}$ ohms per mile.

* * The substitution of glass flooring for boards continues to increase in Paris, this being especially the case in those business structures in which the cellars are used as offices. At the headquarters of the Crédit Lyonnais, the whole of the ground is paved with large squares of roughened glass, imbedded in a strong iron frame, and in the cellars beneath there is sufficient light, even on dull days, to enable clerks to work without gas. The large central hall at the offices of the Comptoir d'Escompte has also been provided with this kind of flooring, and it is said that, although its prime cost is considerably greater than that of boards, glass is, in the long run, far cheaper, owing to its almost unlimited durability.

* * A simple contrivance has been introduced for the determination of melting points, the apparatus consisting of a small platform of thin ferrotype iron or silver, having an opening for the reception of a thermometer bulb, and a small indentation or depression. In the latter, a very small quantity of the substance to be decided upon is melted, and, while still liquid, a thin platinum wire, bent like an L and fused into a glass float, is immersed in the liquid and held there until the substance solidifies. A thermometer is then inserted in the opening, and the whole apparatus plunged under mercury; the latter is generally heated, the thermometer carefully watched, and as soon as the substance melts, the float rises instantly, the temperature being now noted. Stirring is by this arrangement unnecessary. The whole of the material is surrounded with mercury, and the attention can be concentrated on the thermometer, and the most accurate results thus obtained.

* * Mr. Taggart, an undertaker of Allegheny, is making some interesting tests with a new system of embalming, in which electricity plays an important part. The apparatus consists of an air-tight case provided with a bellows at one end and a common battery with connecting wires, etc., inside of he case at the foot. By the use of the electric current it is necessary to charge the body with the embalming fluids by what is known as the hyperdermic system. The fluid is in this process merely applied to the body externally and the electricity causes it to permeate the entire body. The first test under the new process was made by Mr. Taggart some five months since in embalming the body of a child, the result of which far exceeded the most sanguine expectations of the undertaker. The second test was made on Friday last in embalming the body which was found dead on Tuesday at the house of Councilman Brown, on Beaver avenue, Allegheny. Mr. Taggart claims that the new process has done its work admirably, and gives promise of becoming a most popular and successful and permanent method of embalming. The invention is the property of a New York firm.

* * Among the recent mechanical inventions is an ingenious arrangement of dividers and calipers. The legs of the divider are united at the upper ends by a spring, and each is provided at about one-third of its length from the upper end with a widened part having a central circular aperture, the edges of which are made concave transversely; in each aperture a spherical nut is placed from the outside, and extending through the nuts are the ends of a screw having right and left threads, and with a milled disc at the middle. The spring presses the legs from each other, and this exerts sufficient outward pressure against the nuts to hold them in place by friction, and prevent their turning; by turning the milled disc in one direction or the other the legs will be separated or brought together. When the dividers are to be folded for transformation the screw is turned out of the nuts and withdrawn from the legs, the points of which are placed in a case to protect them, and the nuts are attached to the ends of the screw, which is placed in the case, between the legs

* * The first successful attempt at trial trips of the new cable car was made this week in Denver, Col., over a portion of the track of the Denver Electric and Cable Railroad Company on Fifteenth street. The car ran a considerable distance, and at the satisfactory rate of eight miles an hour. A dynamo of twenty horse-power furnishes the motive power for the car. Quite a large number of prominent citizens took rides on the car. Prof. S. H. Short, of the Denver University, has worked very hard to make his invention a success, and his efforts seem to be already reaping their reward. The company have hoped to get their cars running in six weeks or a month. The car which is now being used in making trial trips, is shaped and fitted up very much like an ordinary street car, and is fully as handsome in its style and appointments as any street car in Denver. It was made by Woeber Brothers, of West Denver. The dynamo and other machinery, which is located in a building near the corner of Fifteenth and Tremont streets, and which is used to propel the car, was made by F. M. Davis, of Denver, and all the plant and material used by the company will be of Denver manufacture. Ex-Governor John Evans, W. N. Byers, Rodney Curtis and other well known Denver gentlemen are among the officers and directors of the new company. Some further trips will be made by the car, and large numbers of people will undoubtedly visit Fifteenth street just below the Court House, and between Tremont and Glenarm streets, and inspect the invention and its workings for themselves.

* * A decided departure from the practice hitherto followed in the construction of electric engines for working tramways has been introduced in an electrical locomotive which has been built for the North Metropolitan Tramway Company. Instead of the electric motor being a fixture, and having motion transmitted from it through belt gearing to the wheels of the car, the motor itself revolves, the motion being transmitted through bevel gearing. The system is the invention of Mr. Elieson, and the locomotive has been built by the Electric Locomotive and Power Company, of London. The locomotive is similar in appearance to a short tramcar, and carries a secondary battery, consisting of 50 E. P. S. cells. This battery is connected up with the electric motor, the motion-shaft of which project horizontally about two feet, and carries at its end a spur-wheel which gears into a fixed circular rack. Thus, when the motor is started, it is, by means of this gearing, rotated. A vertical shaft is attached to the under side of the motor, carrying at its lower end a bevel-wheel, which gears into one or other of two similar wheels on the driving-axle of the engine. This miter gearing is fitted with a friction-clutch, by means of which the locomotive can be run either backward or forward. The 50 cells are equal to 280 amperes, and, as the average consumption is stated to be 45 amperes per hour, it follows that there is a good six hours' supply of power carried. The machinery is so arranged that a speed of eight miles an hour cannot be exceeded. Both the locomotive and the tramcar can be electrically lighted at night from the battery by means of glow lamps. We recently inspected the working of this locomotive at the tramway company's depot at Stratford, which was satisfactory in the limited space at command. It was started, stopped, and reversed very readily. The machinery is of a simple character, and can be adapted to the tramcar itself in new stock. The Electric Locomotive Company are building a more powerful engine in order to demonstrate the application of the system on railway lines.—*London Times.*

—— Messrs. Laurence & Herkner, the well-known manufacturers of electric light belts, of this city, furnished six patent round belts for an incandescent electric light machine in use at the American Institute, which worked with perfect success. These are, we believe, the first round belts, run in grooves as these were, used in running electric light machines, and speak well for the excellent belting of this firm.

—— The list of prominent New York buildings published in another column which have adopted the electric-lighting system of the United States Illuminating Company, makes a showing to be proud of, and is a true indication of the splendid work and first-class system of this company. Their business in New York is increasing very rapidly, and giving satisfaction to old and new customers.

—— Electricity, developed by the electric lights, played curious freaks in the town of Meriden recently. Owing to the moist condition of the air, the fluid wandered from its usual pathway—the wires strung about the city, in a most peculiar manner. Early in the evening a citizen passing along in front of Wilcox block accidently brought his hand in contact with one of the iron pillars at the post-office entrances. He let out a yell like a Sioux when he felt the current, and jumped a rod into the street. The shocks were felt at frequent intervals during the evening, and crowds of men and boys hung about the iron pillars which extend the whole length of the block, enjoying the novel sensation.

—— The N. Y. *Daily Indicator*, of December 9th, says: "A very interesting pamphlet issued by the American Electric Manufacturing Company, contains not only a very complete description of the 'American system' of electric lighting, but also some very businesslike remarks, addressed by President Goff, of the American Company, to the agents and officers of the company. Any one who knows Mr. Goff need not be informed that he practices to the full all that he preaches. In fact, he works harder and gives more time and attention to the enterprise in which he is interested than he expects any one else to do, no matter how large the interest of such person in the company. The energy and untiring zeal, as well as undivided attention given by Mr. Goff to the American Company, have placed it at the head of all electric enterprises, and his plain words to the representatives of the company indicate that he desires to impress every one with the same zeal which imbues himself."

Electrical News from Mexico.

The Mexican Telephone Company pays a monthly tax of 15 cents per post to the city government of this capital.

The duplex telegraph system is now applied between this capital and Vera Cruz, and is also at work between Queretaro and San Luis Potosi.

The State of San Luis Potosi has formally accepted the cession of the local telegraph lines, formerly held by the general government.

Juan B. Arellano, of Tlaxcala, a professional telegrapher, has invented a system of telegraphy, by means of which a moving train may communicate with local stations, and a second train may make its presence known to the first, at a sufficient distance to avoid a collision. By observing the instruments it can at once be seen if the track is occupied by other trains.

The Mexican Telephone Company has raised the monthly rent of its instruments in Guadalajara from $3 to $5 for new subscribers. There is some discontent exhibited in the local press, at the new rates, but the company cannot profitably do business at the lower figure The Puebla service is to be thoroughly reorganized, and the business there will probably show a healthy improvement before long.

—— Charles Cooper, president of the Citizens' Electric Illuminating Company, of Brooklyn, has made arrangements with Commissioner Gibb to light the skating lake in Prospect Park with twenty-five electric lamps, during the months of January and February, and, for the convenience of boating parties, the same sheet of water during the months of June, July, August, September and October.

—— The boiler for the Arc Electric Light Works was placed in their building at noon to-day, and has attracted much attention. It was manufactured by P. Delaney, of this city, and furnished under a contract for the greater part of the machinery, by E. P. Hampson, of New York City. The boiler is five feet in diameter and sixteen feet in length, with 102 flues; weighs nearly six tons, is 100 horse-power, and capable of running 200 lights. It will be set with the Jarvis patent setting, causing a consumption of the gases which in ordinary boilers escape. Experts will be here on Monday to attend to its proper adjustment. As the works progress toward completion the interest in the light increases, and already the books show an opening with 40 burners to be in operation, exclusive of exhibition lights.—*Newburg Register.*

—— The all-important question of lighting the city was thoroughly discussed at the meeting of the Board of Improvements, of Cleveland, one day this week Engineer Force was of the opinion that the rays of the moon would have to be depended upon to a certain extent, as the fund was insufficient to provide light all night. Mr. Force was in favor of shutting off the light in the early hours of the morning whenever it was possible. The Mayor is in favor of trying the Brush arch system of electric lighting, which is in use in Evansville, Ind. He said that he had visited that city, and he thought it was the most perfect system in existence. The plan is to erect an arch from which an electric light is suspended on each alternate corner, thus giving a good light in the adjacent territory. The Mayor is not in favor of gas to any great extent, and is of the opinion that the city is getting an inferior quality of gas at the present rate of $1 per thousand feet. He also recommends that the bids for lighting should be a stipulated amount for lighting by the year, and not so much per thousand for gas or a certain amount for each Brush electric mast. The specifications in all cases—gas, electric, and vapor lamps—will be made out so as to receive bids for all-night lighting and part-time lighting. There has been considerable complaint from the districts where vapor lamps are used, and substitution of coal oil is advocated by many. It has not been decided in what proportion gas and electricity will be used, but unless the arch lights are put into use the territory will probably remain as it is at the present.

Use of Water-power for Electric Lighting.

By Ralph S. Tarr.

The Falls of Montmorenci, seven miles from Quebec, have an almost perpendicular fall of 262 feet, and have for many years been utilized as a motive power for some lumber mills near their base. Everything is now ready for the introduction of electric lights into Quebec, and the electricity will be generated by water-power from these falls. The writer visited the works in August last in company with their owner.

The water is conducted from the river through a sluice-way to the edge of a precipice, where it is collected in a tank. This tank is tapped in two places, one opening into a tube which leads to the works below; the other through a waste sluice. The latter leads from the upper part of the tank just above the level of the tube and as long as water runs down this sluice it is a sign that the tube is filled. The amount of water that runs into the tank can be regulated by lessening the quantity of water which supplies the power in the saw-mill, for this supply is tapped from the regular sluice nearer the falls.

The tube leading to the works has an inside measurement of 4½ feet at the top and gradually diminishes to 24 inches at the base. It is built of three-inch wood at the top and of one quarter inch boiler-plate iron for the lower three-fourths of the length. It is calculated to last for fifty years. So great is the pressure that the water actually oozes out through the lower portion of the wooden part of the tube. There is a weight of 165 feet of water at the base of the tube, where it will turn a turbine wheel at such a rate as to furnish 800 or 900 horse-power. The tremendous pressure exerted by this column of water is well shown when one turns on a hydrant which throws a stream of water with such force as to make a deafening roar as it strikes the side of a neighboring building. There are eight of these hydrants at different parts of the lumber yard, and no building is out of reach of a heavy stream of water. On the roof of the main building an iron tube, perforated with holes, is run along the ridge-pole so that in two minutes the whole roof can be flooded.

The large conducting tube is lead into the basement of the building and the water can be turned into a 24-inch iron turbine wheel with eight buckets. The pressure is sufficient to turn the wheel at the rate of 610 revolutions per minute. A perpendicular steel shaft turns two heavy cogs which transfer the motion to a horizontal shaft making 900 revolutions per minute. On this horizontal shaft there are eight pulleys, four feet in diameter, which are connected with eight dynamos on the floor above. Enough electricity will be generated to supply 800 arc lamps in different parts of the city. The turbine is to be kept at the constant velocity of 610 revolutions per minute; this is regulated by a governor connected with a gate which increases or decreases the amount of water flowing into the turbine. To prevent the water in the tube from freezing during the day, when the dynamos are not working, the water will be allowed to run through a gate at the end of the tube thus keeping up a constant circulation.

Everything connected with the works is constructed for durability and is much stronger than is really needed. There are no belts, and the power is conducted to the dynamos almost directly. The ends of the horizontal shaft rest upon Babbitt metal, and to prevent heating the support of the shaft is hollow, and will be filled with a constantly flowing stream of cold water. The water for turning the turbine is carried three-quarters of a mile from the falls to the works.

The works were not in operation when the writer visited them, but the lumber mills have been lighted by electricity for some time. The power for this purpose is furnished by an 8-inch turbine (probably the smallest in the world) running with a force of 60 horse-power and connected with a dynamo that can run 20 lights. Only nine lights are in operation, and are much more satisfactory than those at present used in Quebec.

Navigating the Suez Canal by the Electric Light.

In presence of the continued increase in the traffic through the Suez Canal, even during the present commercial crisis, and to provide for the still greater increase that is anticipated in consequence of the abolition of the pilot dues and the lowering of the tariffs, by which merchandise now reaching Europe from the East and from Australia by the route round the Cape will be able to be sent through the Canal, the company has for the last two years been making experiments with electric lights, with a view to enable vessels to continue their passage through the canal during the night. These experiments (says the Paris correspondent of the *Standard*) have at length proved so successful that it has been resolved to permit from the first of January next all vessels of war and postal steamers provided with the requisite electric lights to navigate by night that portion of the canal comprised between Port Said and kilometer fifty-four. Therefore, in almost half that portion of the canal where ships have to put into sidings to allow other vessels to pass them—in the Bitter Lakes vessels pass each other without stopping—vessels of war and mail boats, that together represent 22 per cent. of the total traffic, will be able to continue their passage at all times of the day and night. This will constitute a great saving of time, and M. De Lesseps in his circular expresses the confident hope that the trial will be so successful as to enable him to authorize, within a short time, night navigation for all descriptions of vessels through the whole length of the canal.

—— The usual proposals for lighting the treets of Brooklyn next year have been received by Commissioner Fleeman. The electric-light companies want $182.50 per lamp, and the gas companies from $19.80 to $22 per lamp per annum.

—— A correspondent to the London *Times* makes the following remarks upon the important subject of railway carriage lighting: "The article in *The Times* of the 19th ult. justly complains of the very indifferent way in which many railway carriages are lighted at the present time, notwithstanding that an efficient electric light has now been in use for at least two years; but if the question is closely examined, much of the surprise at the backwardness in applying this system to railway carriages will disappear. This particular system is now in regular use on two trains on the Brighton, and one on the South-Eastern lines, a dynamo being worked in each case from the axle of the guard's van, while the train is running, the electricity thus generated being stored in accumulators and used as required. Those who have had the management say this method of lighting is perfect, and after two years' trial not a hitch has occurred, nor has any repairing been needed, and these railway companies will, it is expected, extend the system, as it is both cheaper and more effective than any other. Methods of lighting by compressed gas, etc., are undoubtedly superior to oil, and when the use of electricity and gas is fairly introduced, oil lighting must disappear. The advantages in favor of the electric light, as compared with gas, consist in the superior quality of the light, and its being always ready for use when a train enters a tunnel in the day-time. The complaint at present is that the trains lit by electricity or gas must be 'block trains'—*i. e.*, must not be broken up, and other carriages, not fitted for electricity or gas, introduced between those so fitted. This may be a disadvantage at first, but when all the carriages belonging to a line are fitted for one or other of these systems, this difficulty disappears. After a favorable report of the Board of Trade, and two years' successful working of electric light in railway carriages, the time has gone by for further delay or further trials, only it unfortunately happens that many railway companies have their own theory and system and this is the chief cause of the delay in the general adoption of train-lighting by electricity."

—— Electricity for lighting is coming to the front in this city. A careful estimate, based upon an extended experience in the use of the incandescent plant elsewhere, and upon the quantity of light actually used in the city hall and tunnels each day, would indicate that the cost of this light to the city will be the equivalent of gas at from 65 to 70 cents per thousand feet —*Chicago Manufacturer.*

—— The large building of the *Daily Commonwealth*, Topeka, Kansas, is to be lighted throughout by the incandescent light, the Sawyer-Man system (Consolidated Company) being used. The enterprising West is rapidly coming to the front in its recognition of the many advantages of the electric light. For newspaper offices, where the heat and vitiated atmosphere of gas are so prevalent, the incandescent light comes as a Godsend to the printers and editors. It will not be long until every leading newspaper office, or at least the composing room, will be lighted by this illuminant.

—— The introduction of electric illumination into textile mills has been followed by some of the most favorable results, both in regard to the quantity and quality of the manufactured goods, and also the health of the operatives. The value of light in mills is not to be measured by its cost, but by its worth in contributing to the production of the mills. Within late years, mills have been constructed with high rooms and broad high windows, in a manner which incurs additional expense for no other reason than to obtain a better distribution of sunlight. On some classes of figured cloths, it is considered that goods manufactured in summer stand higher in the market than those made during the winter months, when the short days require more artificial light, when by reason of the less thorough illumination, a greater proportion of imperfect work is made. The introduction of the electric light in mills has been followed by numerous favorable results in regard to the principal matters involved in its consideration. The ability of concentrating upon fine or colored work any desired amount of light of a quality capable of disclosing shades of color, yields its result in the character of the work produced The use of the electric light being unattended by any heating or vitiation of the air of a room, has conduced in a material degree to improve the physical condition of mill operatives, and, as a result of better health, they have been able to constitute a more perfect organization, whether consideration is given to the slight ailments that merely interfere with the power of continuous labor, or to greater difficulties sufficient to incapacitate persons from work for days at a time.

—— Denver is to be illuminated by electricity. President Cheeseman joined Messrs Rundle and Tabor in New York, where they expended $10,000 in the necessary plant. Among this are two 60 horse-power dynamos, thirty miles of No. 11 and No. 12 copper wire, nearly 500 incandescent lamps, and various other properties; and as special arrangements have been made with the railroads to ship everything by fast freight lines, the entire plant purchased is expected in Denver by the 20th inst. The Denver municipal electric-lighting system will comprehend twenty circuits, with twenty-seven lamps to a circuit when each circuit has its full complement. The lamp will be placed on the present gaslight posts extended up some four feet. The light will be fully three times greater than the present gas flame, and immeasurably superior to the antiquated oil lamps of the past century, which, however, have been a great improvement on the darkness that enshrouded the streets for the few nights of the interregnum between gas and oil. The electric company have now four engines, viz.: One 250 horse-power, one 166 horse-power, and two 60 horse-power engines; one of the former being a fine new Corliss which is worth visiting. So they have ample power for the new dynamos. Gangs of men have been at work three weeks in preparing and locating the poles for the wire; and Mr. Rundle will begin active work in preparing for the new plant so that the moment it arrives it can be put into position without any delay. It is not decided yet where to locate the central station, but it will be where the circuit can be of as nearly equal length as possible. The longest will be the one out toward Moose street, about five miles out and back. The cost per lamp is $28 per year, against $35, the lowest offer the gas company would make; thus saving the city on its 450 lamps, $3,150 per year!

Electric Light News

—— Columbus, Neb., is to be furnished with the electric light, forty subscribers having been secured.

—— A headline in a Cincinnati paper calls attention to the fact that the electric lights wires are not sufficiently "indolated."

—— Raleigh, N. C., now has the electric-light on an extensive scale, and her citizens are much rejoiced. There are several lamps on top of the capitol.

—— The Brush Company, of Pittsburgh, has 1,800 arc lamps in use—one of the largest plants in the world. This company will soon put in several incandescent plants in that city.

—— A committee of three has been appointed by the City Council of Burlington, Iowa, to visit cities where the electric light is used for city lighting, and if they report favorably, as they no doubt will, electricity will soon take the place of gas at Burlington.

—— The Union Electric Company, No. 1 Ann street, have gone into the manufacture of electric-light scarf pins quite extensively. They manufacture a very small and complete battery, readily carried in the vest pocket, and also a great variety of styles of the scarf pin.

—— At a meeting of directors of the Rock Island County (Ill.) Brush Electric Light Co., held December 10th, the following officers were elected for the ensuing year: J R. Johnston, President; C. Speidell. Secretary; A. D. Huesing, Treasurer, and James Blaisdell, Superintendent.

—— The excellent business that the Schuyler Electric Light Company has secured since January 1st, is still continuing, several new plants having recently been contracted for. Their system, which was fully illustrated in the Review last March, is an excellent one, and the success they have secured is well deserved.

—— The selectmen of Deering have contracted with the Consolidated Electric Light Company, of Portland, Me., to light the shell road from Portland to Woodford's Corner. Five or six arc lights are to be erected at once. It is thought the Maine Central Railroad will also put in one or two of these lights at the Woodford Station.

—— The Stout-Meadowcroft Company have issued a very complete and well illustrated catalogue of their electrical apparatus. This enterprising company continually manufacture new and valuable electrical inventions, and are receiving that patronage from the public that first-class work and square dealing are sure to bring.

—— The Waterbury Electric Light Company, Waterbury, Conn., have decided to increase their power, and will add another boiler and Armington & Sims engine. The boiler will be set with the Jarvis patent furnace. The contract for the plant will be placed with the Jarvis Eegineering Company, of Boston.

—— The Electric Light Company, at Portland, Me., is offering $100 reward for the detection of any person willfully interfering with the electric lights. The company state they have had a great deal of trouble by reason of malicious persons cutting the wires and breaking the circuits and otherwise maliciously interfering with the running of the lights. They have tried to detect the criminals who are doing this business, but so far have not succeeded in finding them. They appeal to the public by their notice published in the papers of that city. They will also set in motion as careful a system of detection as possible to bring any future offenders to justice.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING DEC. 8, 1885.

351,754 Frictional electric generator: Philip Atkinson, Chicago, Ill.
351,814 Regulator for dynamo-electric machines; Benjamin F. Orton, East Saginaw, Mich.
351,815 Dynamo-electric machine; Benjamin F. Orton, East Saginaw, Mich.
351,816 Regulator for dynamo-electric machines; Benjamin F. Orton, East Saginaw, Mich.
351,818 Dynamo-electric machine or motor; Benjamin F Orton, East Saginaw, Mich.
351,826 Electric register and recorder for fares, etc.: Edward A. Scales, Lowell, Mass., assignor by mesne assignments to the Electric Fare Register Company, Portland, Me.
351,830 Making magnets self-keeping; Erva B. Silliman, Bridgeport, Conn.
351,851 Cable conveyance; Chas J. Van Depoele, Chicago, Ill.
351,880 Electric motor; Warren S. Hill, Boston, Mass.
351,955 Telephone exchange; Wm. S. Ford, Denver, Col.
351,975 Quadruplex and duplex telegraph; David H. Keeley, Ottawa, Ont., and Aaron A. E. Garvey, Montreal, Quebec, Can.

PROPOSITIONS FOR GAS —AND— ELECTRIC LIGHTING.

PROPOSITIONS ARE HEREBY INVITED, AND WILL BE RECEIVED BY THE UNDERSIGNED COMMITTEE, FOR THE PURPOSE OF LIGHTING THE CITY OF MONTGOMERY, ALABAMA, WITH GAS AND ELECTRICITY—POP. 25,000.

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T. H. CARR, Alderman,
J. W. HALE, "
A. A. WILEY, "
T. J. WILLIAMS, "
Committee.

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Electric Light Companies, Manufacturers of Electric Light Apparatus, Machinery and Supplies,

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Oak Pins and Brackets
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TELEPHONE SWITCHBOARDS,
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100,000 CARBONS PER WEEK.

Using the purest materials and with machinery of our own invention,

Every Carbon is manipulated separately from the beginning of the operation until finished.

They are, therefore,

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In straightness, length of time in burning, brilliancy and steadiness of light they excel all others, and are adapted to the various systems of lighting in use.

FOR SALE,
One Ide Automatic Engine,
15x20.
In use by us less than one year. Will sell at HALF the original cost. Also one VAN DEPOELE, ten-light dynamo and lamps, complete. Will sell at One-third original cost. In our works about one year; in actual use less than two months.
THE BOULTON CARBON CO.,
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1 Ann St., New York.

One Hard Rubber Cell, hermetically sealed, with rubber-covered cord, push-button and lamp holder; one lamp mounted in a pin set with imitation stones, one bottle of liquid and funnel. All complete,
$2.00 cash, or C. O. D.
Incandescent lamps (iridium-plated platinum) of ⅛ and ¼ C. P., 1.9 volts, ¾ ampere, for Christmas trees, flower baskets, etc.
$10.00 a Hundred.
100 lamps may be run by one cell with 3 zincs, and 4 carbons of ¼" x 6" x 12".
Desk lamps of 6 C. P., with battery complete,
$10.00.

The United States Illuminating Company,
59 AND 61 LIBERTY ST., NEW YORK.

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Coleman House,
Hotel Dam,
St. Denis Hotel,
Bechtel's Brewery, Staten Island,
Brooklyn Eagle,
Oppermann & Muller, Turtle Bay Brewery,
Equitable Building,
New York Ferry Co.,
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Gonda (formerly Prism) Battery, Complete.
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THE STANDARD OPEN CIRCUIT BATTERY OF THE WORLD.
And beyond question the best for all purposes for which open-circuit batteries are required.

The Genuine Leclanché Gonda and Disque Cells are made only by us, and none are genuine without the Label, as shown in cut, and the

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Price of the Gonda reduced to $1.20 per cell, complete
" " Disque " " 1.00 " " "
SEND FOR PRICE LIST, WITH DISCOUNTS.

THE LECLANCHÉ BATTERY CO.,
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Standard ✣ Electrical ✣ Works,
MANUFACTURERS OF
TELEGRAPH AND TELEPHONE APPARATUS,
Hotel and House Annunciators, Burglar Alarms,
CALL BELLS, "POST'S" MAGNETO BELLS,
PINS and BRACKETS, BATTERIES, &c., &c.
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IRON, STEEL and HARD-DRAWN COPPER WIRE, Delivered at Lowest Prices.
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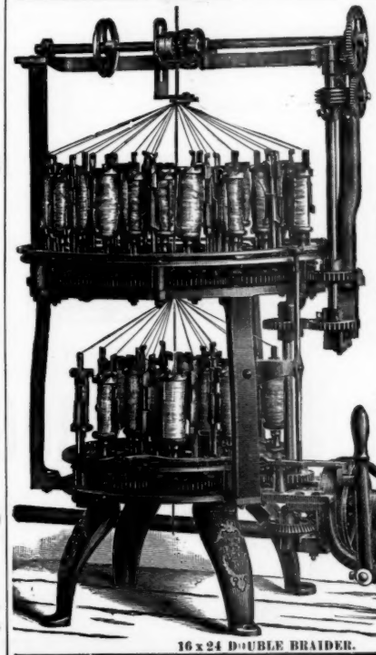

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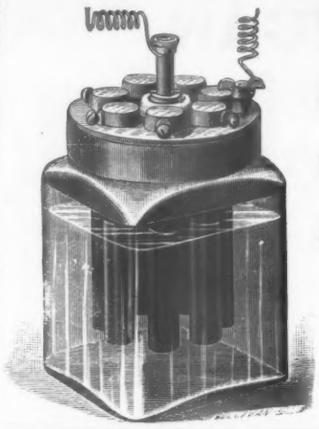

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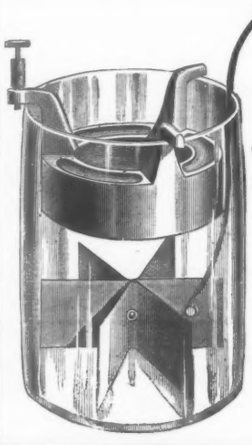

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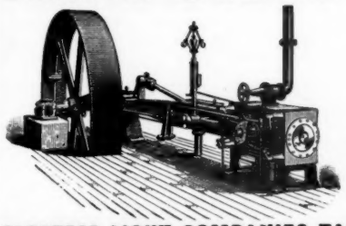

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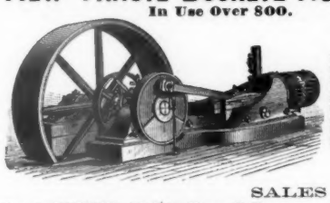

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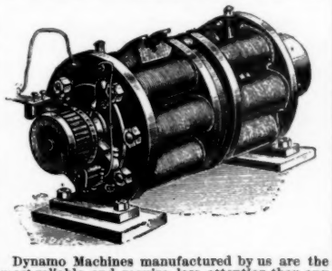

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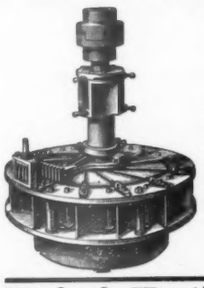

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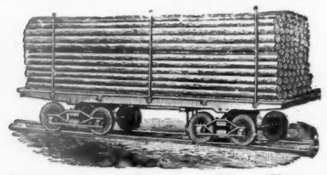

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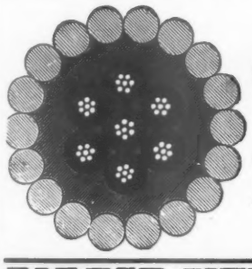

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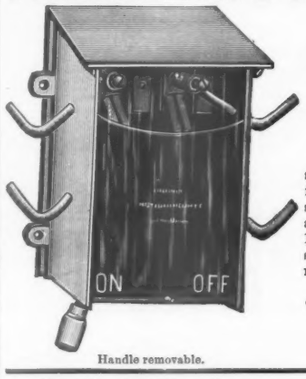

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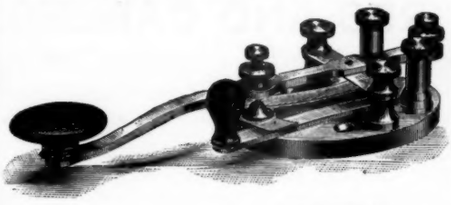

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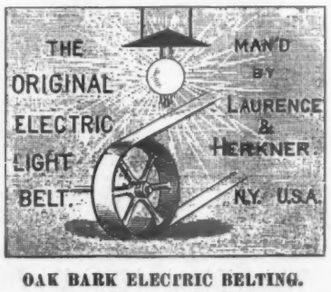

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